Developing a Model of the Demographic, Health Behavior, and Health Indicator Predictors of Sleep Quality in Emerging Adults at a Large Midwestern University

By

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Abstract

This study described the state of emerging adults' sleep quality and defined a model of sleep quality in the population. The purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the population as measured by the American College Health Association's National College Health Assessment-II. The participants were 762 (n = 291 male, n = 471 female) undergraduate students, ages 18 to 23, enrolled at a large Midwestern university.

Descriptive statistics were used to determine the current descriptive picture of students' sleep. Descriptive results indicated that students have poor sleep quality, less than half have received information on sleep from the university, and students are interested in receiving information, but only 2.6% have been diagnosed or treated for a sleep disorder.

Structural equation modeling (SEM) was conducted to determine if survey data supported the proposed causal model for sleep quality or described a reduced alternate model. SEM results indicated a good fit model with six observed sleep quality indicator items identifying two related constructs of sleep quality, sleep quality somnolence and sleep quality insomnia, which were predicted by gender, poor general health, high stress, sleep diagnosis, frequency of binge drinking, and anxiety or depression diagnosis. Based on the findings additional research is needed to further test the model, examine non-significant variables further, and consider additional variables.

Findings resulted in the conclusion that university health promotion and education should indeed address sleep quality, and best practices to do so may focus on overall wellness, stress reduction, and reduction of binge drinking with special focus on females and individuals diagnosed with sleep disorders, anxiety, and depression.

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Chapter 1

Introduction

Sleep is an often overlooked health behavior that is an integral part of health and well-being. Numerous benefits to well-being are obtained when optimal sleep quality and quantity are obtained, however there is a plethora of potential negative outcomes related to suboptimal sleep quality and quantity. A strong basis of literature supports the importance of sleep in adult and youth populations, however the field is only beginning to expand on knowledge of similar patterns in the emerging adult population. A recent editorial by Wolfson (2010) on adolescents and emerging adults' sleep patterns expressed that while an understanding of adolescent' sleep and the consequences of it is beginning to form, questions are still arising, and one such area is sleep difficulties in older adolescents or emerging adults. Furthermore, few studies of careful design have been able to articulate or capture emerging adults' or college age adolescents' changing sleep patterns (Lund, Reider, Whiting, & Prichard, 2010). This study examined if similar patterns between demographic, health status, and health behavior variables may predict a model of influence on sleep quality measures surveyed in the American College Health Associations' (ACHA) National College Health Assessment –II (NCHA - II).

Statement of Purpose

The purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the population as measured by the American College Health Association's National College Health Assessment-II.

Research Questions

The research questions for the current study were derived from the National College Health Assessment – II (2011) (Appendix A):

1. What is the current status of students' sleep as described by the NCHA – II?
    a. What percentage of students have been diagnosed or treated by a professional for Insomnia or other sleep disorder in the past 12 months?
    b. What percentage of students found sleep difficulties to be traumatic or very difficult to handle within the last 12 months?
    c. What percentage of students report sleep difficulties interrupted their academic performance within the last 12 months?
    d. What percentage of students report having received information on sleep difficulties from the university?
    e. What percentage of students report being interested in receiving information on sleep difficulties from the university?
    f. On average, how many days per week do students feel they got enough sleep so that they felt rested when they woke up in the morning?
    g. On average, how many days per week do students feel they awakened too early in the morning and couldn't get back to sleep?
    h. On average, how many days per week do students feel they were tired, dragged out, or sleepy during the day?
    i. On average, how many days per week do students go to bed because they just could not stay awake any longer?

j. On average, how many days per week do students have an extremely hard time falling asleep?

k. On average, how much of a problem do students have with sleepiness (feeling sleep, struggling to stay awake) during their daytime activities?

2. Do survey data support the proposed causal model for sleep quality, or describe a reduced alternate model?

Significance

The majority of research on sleep as it may relate to health and well-being has been conducted in adult and youth populations. The Institute of Medicine (IOM) estimated that 50 to 70 million Americans suffer chronically from wakefulness or sleep disorders, which the organization associates with numerous health consequences (Colton & Altevogt, 2006). Currently, the focus of sleep research in college students has only begun to branch away from the impact that sleep has on academic performance. A recent editorial by Wolfson (2010) on adolescents' and emerging adults' sleep patterns expressed that while an understanding of adolescent sleep and the consequences of it is beginning to form, questions are still arising, and one such area is sleep difficulties in older adolescents or emerging adults. Wolfson (2010) highlighted how Lund et al. (2010) described how few studies of careful design are able to articulate or capture emerging adults' or college age adolescents' changing sleep patterns.

Suboptimal sleep has been shown to be affected by a wide variety of factors in adults and children, including behavioral determinants, environmental determinants, and sleep related disorders themselves. Socioeconomic status, behavioral and lifestyle factors (smoking, alcohol consumption, physical activity, and obesity), age and gender related factors, and sleep complaints and stress are those primarily discussed (Bixler, Vgontzas, Lin, Vela-Bueno, &

Kales, 2002; Cappuccio et al., 2008; Goel, Kim, & Lao, 2005; Ohayon, Carskadon, Guilleminault, & Vitiello, 2004; Schoenborn & Adams, 2008; Stamatakis, Kaplan, & Roberts, 2007; Strine & Chapman, 2005; Vgontzas et al., 2008; Zhang & Wing, 2006).

Strine and Chapman (2005) studied the effects of frequent sleep insufficiency on health-related quality of life and health behaviors, and concluded that sleep is an important component of general medicine and should be assessed. The researchers found that 26% of respondents to the Behavioral Risk Factor Surveillance System (BRFSS) reported sleep insufficiency on 14 or more days in the past month. In terms of health-related quality of life, individuals reported significantly more physical distress, mental distress, depressive symptoms, activity limitations, pain, anxiety, and general poor health. These health related quality of life variables were augmented by a list of poor health behaviors engaged in more often by those with insufficient sleep. Strine and Chapman (2005) reported more poor health behaviors, including smoking, drinking heavily, and being more physically inactive and obese.

It is conceivable that these negative health outcomes and increased poor health behaviors interact to result in compounded negative health effects. Perhaps the most interesting relationship between sleep and health is that it is bi-directional, which serves to create a cyclical battle between poor sleep causing health conditions and health conditions causing poor sleep that only ceases at death. Several of these conditions have begun to be studied in depth in the general adult population and among children, including the relationship between sleep and body weight, sleep and chronic conditions, and sleep and mental health conditions.

Extending the examination of health related predictors of sleep and outcomes of sleep into the emerging adult population might highlight areas of prevention that could ward off future health disparities related to poor sleep across the lifespan in adults. The college campus is one

location where the emerging adult population may easily be studied, and a large percentage of the population may be reached for behavior change programing to promote better sleep quality.

Scope of the Study

There were three delimitating factors to this study. They were:

1. Participants were from a large Midwestern university.
2. Participants used in the data analyses were undergraduate students ages 18 to 23.
3. Data were acquired through the use of the American College Health Association's National College Health Assessment – II survey.

Assumptions

Assumptions for this study were:

1. Participants responded honestly and accurately to items on the survey.
2. Participants comprehended survey items as intended by survey developers, thus allowing reliable answers.
3. Participants surveyed matched a representative sample of the entire university student body population.

Limitations

There were three limitations to the study, as follows:

1. Participants may not be representative of college students nationwide.
2. Participants were volunteers from courses in which faculty agreed to allow data collection in class.
3. Some items on the survey asking questions of a sensitive nature may have caused some participants to discontinue the study or skip certain survey items.

4. Measurement was primarily of individual level variables, and did not fully address interpersonal or community level factors.

Definitions

For the purposes of this study the following definitions were used:

Sleep Quality: A subjective measure, including the extent to which sleep leads to tiredness upon waking and throughout the day, feeling rested and restored upon waking, and the number of awakening times throughout the night and other sleep disturbances (Harvey, Stinson, Whitaker, Moskovitz, & Virk, 2008).

Sleep Latency: The time elapsed between lights out, or the initiation of sleep, and the onset of stage one of sleep, or falling asleep (Mindell & Owens, 2010).

Somnolence: Excessive daytime sleepiness referring to subjective feelings of difficulties staying fully alert, remaining awake, and an increased tendency to fall asleep due to sleepiness (Guilleminault, 2005).

Insomnia: difficulties in initiating and maintaining sleep, or falling asleep, and waking too early (Hohagen, Käppler, Schramm, Riemann, Weyerer, & Berger, 1994).

Sleep Quantity: The duration or amount of time spent asleep during one sleep episode, minus the amount of time spent lying awake in bed.

Wellness: The healthy balance of a person's physical, psychological, social, emotional, spiritual, and intellectual states that lead to an overall feeling of well-being.

Emerging Adult: An individual that is transitioning from youth and teenage years into adulthood, marked by physical and psychological maturation.

College Student: Students, ages 18 to 23, that are enrolled in a college or university.

Health Behavior: A behavior that leads to either increased or decreased physiological or psychological health.

Health Status Indicator: A measurement of morbidity or mortality related health aspects or outcomes that are either negative or positive.

Structural Equation Modeling: A type of statistical technique that examines the covariation among observed variables to reduce the number of observed variables into fewer latent, unobserved, constructs and test the fit of a model through confirmatory factor analysis (measurement model) and multiple regression (structural model) (Schreiber, Stage, King, Nora, & Barlow, 2006).

Chapter II

Review of the Literature

Introduction

America as a whole is overwhelmingly sleep deprived (Colton & Altevogt, 2006). This deprivation is a product and production of poor sleep hygiene, a spectrum of sleep disorders, and a demanding society. The Institute of Medicine (IOM) estimated that 50 to 70 million Americans suffer chronically from wakefulness or sleep disorders, which the organization associates with numerous health consequences (Colton & Altevogt, 2006). Additionally, many of these sleep disorders go undiagnosed, and "while we often consider sleep to be a "passive" activity, sufficient sleep is increasingly being recognized as an essential aspect of health promotion and chronic disease prevention in the public health community" (Centers for Disease Control and Prevention, 2011). The need for this is characterized by the common lay phrase "I will sleep when I die", which is a reflection of a demanding society.

Although the current emphasis on sleep among the general population is negligent, historically sleep has been attended to progressively in research. Literature from the late 1800's investigated sleep beginning with an early illustration of the relationship between sleep physiology, pathology, hygiene, and psychology (Manacéïne, 1897). This literature is strikingly similar to current research, only in a preliminary manner. Study of the physiology of sleep focused on the changes in physiological systems such as the nervous and respiratory systems, while the study of pathology focused on insomnia, narcolepsy, and dream states (Manacéïne, 1897). In relation to the behavioral aspects of sleep, the study of the hygiene of sleep centered around how much sleep is necessary, the influence of sleep in disease, effects of habits (such as tobacco use) on sleep, injurious effects of excess sleep, and methods of combatting insomnia

(Manacéïne, 1897). Finally, the psychology of sleep research focused on types of dreams and their significance (Manacéïne, 1897). Continuing into the early 1900's the focus of sleep research was on what occurred physiologically during sleep and how experimental insomnia affected the body (Kleitman, 1923). Another commonly studied phenomenon in the early 1900's was sleep positions' relation to health (Johnson, Swan, & Weigand, 1930; Manacéïne, 1897).

One historical perspective of critical importance is that while literature agreed that infants, children, and pre-pubertal youth needed more sleep for development in similar quantities as described modernly, there was a debate that at the completion of growth around 19 or 20 years, as little as 6 hours of sleep was needed ((Manacéïne, 1897). Klietman (1923) expressed that "there is a large 'factor of safety' in the amount of sleep we are getting, and that it could be considerably reduced (from the suggested eight hours) without impairment of health or loss of efficiency" (p. 67). This belief in a factor of safety is still prevalent among those outside the sleep community, however research is proving a loss of health and efficiency does in fact result from such reduced sleep.

Recently, Shepard et al. (2005) summarized the history of sleep medicine in the United States and major advances over the past 70 years that have led to sleep science as an important area of research and sleep disorders as a public health concern. They described how the historical scientific process began with the discovery of electroencephalography to understand the stages of sleep in 1875, the understanding of narcolepsy across the last century after its first description in 1880, over 50 years of research on restless leg syndrome and sleep apnea, a review of insomnia prevalence, health effects, and treatments, and finally chronobiology and the study of the biological clock. The current research branches into several areas including a continued study of the physiological sleep states, clinical sleep concerns, and the connections between

sleep and heath. The later of the three is of primary interest for the current research, as well as how it may relate to the emerging adult population.

Optimal Sleep for Health and Wellbeing

In order to fully understand sleep as a health concern, "appropriate sleep" should be defined. The National Sleep Foundation (2011) indicated that adults need 7 to 9 hours of uninterrupted sleep for proper functioning and health, teens should receive 8.5 to 9.25 hours, school age children 10 to 11 hours, preschoolers 11 to 13 hours, and even more for toddlers, infants, and newborns. These amounts are ranges, for optimal sleep is dynamic in that too little as well as too much can lead to poor morbidity and mortality related outcomes (Bixler, 2009). The current mentality of American society towards never ending productivity does not promote these ranges of sleep duration, and populations such as college students have unique situations, such as living in a residence hall and participating in multiple activities, that may perpetuate the issue. These challenges of modern society lead to suboptimal sleep quality and outcomes.

Suboptimal Sleep and Sleep Disorders

Suboptimal sleep includes a variety of sleep related problems as well as sleep duration. Most reported sleep related problems are characterized by difficulty falling or staying asleep, daytime sleepiness, abnormal movements, behaviors, or sensations during sleep, or sleep-disordered breathing (Colton & Altevogt, 2006). Inadequate sleep duration is that outside of the optimal defined hours for an individual's age in both directions. In fact, current results from a wide variety of studies find that mortality rates increase up to 50% for those who sleep more than eight hours per day (Patel, Malhotra, White, Gottlieb, & Hu, 2006), contrary to the popular lay health concept that only sleep deprivation is bad for health and wellbeing. In general the National Institutes of Health stated that, "sleep disorders are problems with sleeping, including

trouble falling or staying asleep, falling asleep at the wrong times, too much sleep, or abnormal behaviors during sleep" (Merrill, 2011). In total, there are over 100 sleep disorders falling into four main categories: (1) problems falling asleep and staying awake (insomnia), (2) problems staying awake (excessive daytime sleepiness), (3) problems sticking to a regular sleep schedule (sleep rhythm problems), (4) and unusual behaviors during sleep (sleep disruptive behaviors) (Merrill, 2011). In terms of sleep quality, it is a subjective measure, including the extent to which sleep leads to tiredness upon waking and throughout the day, feeling rested and restored upon waking, and the number of awakening times throughout the night and other sleep disturbances (Harvey et al., 2008). Measurement of sleep quality therefore should be broad in range and content of questions to best capture the differing experiences of individuals.

Prevalence of Suboptimal Sleep in America

The Institute of Medicine (IOM) estimated that 50 to 70 million Americans suffer chronically from wakefulness or sleep disorders, which the organization associates with numerous health consequences (Colton & Altevogt, 2006). This suffering transcends across sectors of society and individual and group characteristics, although much focus has been placed on those with chronic comorbid conditions and the elderly, adolescents, and middle aged adult. A population where less research is available is the young adult who is transitioning into adulthood, such as college age individuals.

In the general adult population, a nationally representative sample of adults with an average age of 44.28 years, from the Sleep in America Poll by the National Sleep Foundation, found that in relation to long and short sleep durations, individuals who slept a recommended 8 hours per night reported less sleep complaints than those who slept longer or shorter times (Grandner & Kripke, 2004). The sleep complaints reported more often by short and long

sleepers included difficulty falling asleep, wakening too early, daytime sleepiness, wakening during the night, and wakening unrefreshed (Grandner & Kripke, 2004). These sleep complaints may lead to another sleep related issue, napping.

Napping is a sleep related issue in adults that can translate to youth as well. Problems, such as the sleep complaints previously defined, may lead to the desire to nap during the day, however there is debate on whether napping may be beneficial or detrimental to nighttime sleep (Foley, Vitiello, Bliwise, Ancoli-Israel, Monjan, & Walsh, 2007), which may perpetuate the problem. Foley et al. (2007) attempted to describe the correlates and prevalence of regular napping. Using the National Sleep Foundation Sleep in America Poll, among 1,506 adults aged 55 to 84, Foley et al. (2007) found that napping increased as age increased as well as complaints of daytime sleepiness, depression, bodily pain, and nocturia. It is a widely known lay fact that college students nap often, and the desire to do so may be related to a variety of factors such as poor sleep quality associated with a college environment and academic and social demands faced by a college student. Research has shown that the emerging adult population's sleep is suboptimal (Hicks & Pellegrini, 1991), and related to poor health and wellbeing outcomes (Pilcher, Ginter, & Sadowsky, 1997)

In children, inadequate sleep has been associated with characteristics related to health and family. A nationally representative sample of 68,418 elementary school aged children (6 to 11 years) and adolescents (12 to 17 years) from the 2003 National Survey of Children's Health found that elementary school aged students with inadequate sleep were likely to have a father with poor or fair health or problems at school, while adolescents with inadequate sleep were likely to have atopic conditions, frequent or severe headaches, experienced frequent parental anger, or had a parent with poor emotional health, as reported by their parents (Smaldonoe,

Honig, & Byrne, 2007). Both groups of students displayed depressive symptomology, had parental concern that the child was not always safe at school, in their neighborhood, or at home, and often had family disagreements involving heated arguments. Overall, weighted results of the study indicate that approximately 15 million American children have suboptimal or inadequate sleep (Smaldonoe et al., 2007). The negative consequences of chronic sleep deprivation in youth are plentiful, including mood and behavior problems, drug and alcohol use, vulnerability to catastrophic accidents, development of major disorders of the sleep/wake cycle (Carskadon, 1990), learning, and growth issues (Meltzer & Mindell, 2006). These consequences on children's wellness are alarming and left unaddressed may extend into later life, and become a cause for concern across the transition into adulthood.

Currently, there is a limited focus on the emerging young adult. Data from the 2005 to 2006 National Health and Nutrition Examination Survey included older youth (15 to 19) and young adults (age 20 to 29) with older adults (Ram, Seirawan, Kumar, & Clark, 2010). While very few had a diagnosed sleep disorder, older youth had a sleep duration average of 7.4 hours, which is more than an hour less than the lowest recommended amount for the age group, while young adults had a sleep duration average of 7 hours, which is just at the cusp of the recommended amount for the age range (Ram et al., 2010). This is concerning considering older youth (teenagers) and young adults (in their twenties), are still developing and may require up to almost 10 hours per night for optimal outcomes (National Sleep Foundation, 2011). Unfortunately, Ram et al. (2010) focused their discussion of results on the general adult population, failing to consider the unique issue of inadequate sleep for the emerging adult. Additionally, the analysis of prevalence of sleep habits and sleep-related difficulties in the national survey combined age into categories of 16 to 39, 40 to 59, and over 60 (Ram et al.,

2010). It does not seem appropriate to include a teenager or individuals in their early 20's with those approaching 40 considering both development and life circumstances. It is plausible that young adults' sleep in their teens and twenties will influence their sleep and related outcomes, such as health disparities, during their thirties and beyond.

A recent editorial by Wolfson (2010) on adolescents' and emerging adults' sleep patterns expressed that while an understanding of adolescents' sleep and the consequences of it is beginning to form, questions are still arising, and one such area is sleep difficulties in older adolescents or emerging adults. Wolfson highlighted how Lund et al. (2010) described how few studies of careful design are able to articulate or capture emerging adults' or college age adolescents' changing sleep patterns. Wolfson (2010) described the end of adolescence as marked by a "complexity of physical, psychological, social, and cognitive measures", and at this time there is an abrupt shift in sleep schedules at roughly age 20 (Roenneberg et al., 2004). This transition is one that could easily be studied by utilizing the easily accessible undergraduate college student to develop a model of the factors predicting sleep quality in the population. Data on college age students are beginning to become a primary source of understanding sleep in the emerging adult; however, it is only beginning to focus on behavior related to health and wellbeing rather than academic success.

Determinants of Suboptimal Sleep

Suboptimal sleep has been shown to be affected by a wide variety of factors in adults and children, including behavioral determinants, environmental determinants, and sleep related disorders themselves. Socioeconomic status, behavioral and lifestyle factors (smoking, alcohol consumption, physical activity, and obesity), age and gender related factors, and sleep complaints and stress are those primarily discussed. Over the past 50 years, sleep duration has

declined 1.5 to 2 hours in both American adults and adolescents (Cauter, Speigel, Tasali, & Leproult, 2008). While these determinants are becoming clearer, as well as the fact that sleep quantity and quality are reducing, what is not clear is whether this is a reflection of modern lifestyles reflecting longer working hours, internet and television, or something else. Additionally, to move forward in the creation of a complete understanding of predictors of sleep in our society it needs to be understood how or if these factors, or others, play a role in the emerging adult population as well.

Socioeconomic Status (SES)

In a 34 year study, Stamatakis et al. (2007) found that low SES predicted short sleep duration of less than 7 hours per night, and in addition this suboptimal sleep was the most frequent among individuals with lower education and lower income who were Hispanic or African American. These findings remained after adjusting for age and health related characteristics. Sleep durations increased similarly for differing income and education groups, however the rates of increase for individuals from different race/ethnic groups differed. The rate of increase was significantly higher for African American and Hispanic individuals compared to Caucasians. Several SES related factors such as living conditions were found to be mediators of short sleep duration in all income, education, and ethnic groups (Stamatakis et al., 2007). It is important to note however that SES findings may be confounded by the fact that individuals with lower SES's may be more likely to engage in work such as manual labor or that requiring long hours, which could affect both sleep and health. It has also been reported that sleep quality may play a role in mediating how SES translates into both physical and mental wellbeing through education and income (Moore, Adler, Williams, & Jackson, 2002). The association of these findings with ethnicity is of interest as well, for research has found that sleep regulation and

patterns in healthy individuals is remarkably similar across groups (Rao, Poland, Lutchmansingh, Ott, McCracken, & Lin, 1999). Thus, the SES of individuals across all groups may be a more important variable to consider directly, than someone's ethnicity.

Health Behaviors

Cigarette smoking, heavy drinking, physical inactivity, and obesity have been associated with both short and long sleep durations in the National Health Interview Survey (Schoenborn & Adams, 2008). Smoking rates were lowest (18%) among adults who slept 8 hours per night, followed higher by those who slept more than 9 hours per night (26%), and highest (31%) among those who slept less than 6 hours per night. These rates compare to the baseline 21% of American's who smoke. Heavy alcohol use was more prevalent among those who slept less than 6 hours per night (22%) than among those sleeping 7 to 8 hours (19%), or 9 hours or more (19%). The effects of both smoking and heavy alcohol use were most notable for younger adults, while heavy alcohol effects were strongest and more prevalent among men. Leisure time physical inactivity rates were lowest among those sleeping 6 hours per night (39%) or the desired 7 to 8 hours per night (38%). These rates compare to those who slept less than six hours or more than nine hours, who had the highest rates of physical inactivity. These results were the most pronounced for Non-Hispanic black individuals. In relation to inactivity, those who slept less than six hours per night had the highest rate of obesity compared to those who slept seven to eight hours having the lowest (33% and 22% respectively). These findings were consistent across all ethic groups, genders, and ages (although less pronounced among those over the age of 65 years). Other research has also found that use of recreational drugs, such as cocaine, marijuana, and Ecstasy, has pronounced effects on sleep (Schierenbeck, Riemann, Berger, & Hornyak, 2008). It is interesting to consider how these and other poor health behaviors, such as

binge drinking, in college may relate to poor sleep quality compared to the general adult population as expressed by the National Health Interview Survey.

Stress

Stress has been identified as a correlate with sleep through several mechanisms. Both chronic and occasional insomnia have been found to be linked to employment related stress and work (Bixler, 2009). Additionally, chronic emotional stress, as well as stress related to insomnia or sleep difficulty itself, have been found to predict short sleep duration in populations such as the obese (Vgontzas et al., 2008). Overall, we live in a demanding society that promotes stress for the general population that clearly influences sleep. It is plausible that this may be equally true for the emerging young adult in college, if not even more so due to the multitude of demands and stressors experienced by a college student only beginning to learn how to cope with stress on their own as an adult.

Age

It is difficult to understand the relationship between sleep problems and age, for with age comes comorbid conditions that influence sleep. However decreases in total sleep time, sleep efficiency, and slow-wave sleep have been found through polysomnographic methods, as well as the increase of waking after sleep onset with age (Ohayon et al., 2004). The concern with this trend is that the current health paradigm is not one of prevention; therefore, rather than working towards prevention, young adults who may be at risk for having a sleep disorder later in life are over looked, as well as those with current sleep quality that may influence disease processes later.

Gender

Related to differences among age groups, is gender differences in sleep and sleep

disorders. In healthy individuals, hormonal and physical changes related to development across the human lifespan lead to an increase in risk of sleep problems for women. This pattern of difference between men and women becomes wider with age from puberty, to pregnancy, and menopause (Krishnan & Collop, 2006). These changes result in women having more sleep related complaints than men overall (Bixler et al., 2002; Zhang & Wing, 2006), although they tend to have better sleep quality compared to men (Goel et al., 2005). Furthermore, men are better able to function at their best compared to women on less than 7 hours of sleep (58% versus 43%) (National Sleep Foundation, 2005). This research seems to be suggesting that female college students may have poorer sleep compared to male college students; however that it is not influencing their sleep quality. The question that needs to be answered is whether or not the differentiation between genders also exists in the emerging adult population, such as college students. It also should be considered that female and male college students may engage in different behaviors that may promote or inhibit sleep, as suggested previously concerning health behaviors.

Negative Effects of Suboptimal Sleep

Inadequate sleep typically is identified as sleep deprivation; however, research has also shown that sleep duration longer than this optimal amount is a risk factor for mortality, and is described through both confounding and mediating effects (Stamatakis & Punjabi, 2007). While any individual cross-section of the American population may have unique health concerns and inadequacies related to sleep, research and lay knowledge is in agreement that sleep inadequacies and health related problems exist in the general population. Strine and Chapman (2005) studied the effects of frequent sleep insufficiency on health-related quality of life and health behaviors, and concluded that sleep is an important component of general medicine and should be assessed.

The researchers found that 26% of respondents to the Behavioral Risk Factor Surveillance System (BRFSS) reported sleep insufficiency on 14 or more days in the past month. In terms of health-related quality of life, individuals reported significantly more physical distress, mental distress, depressive symptoms, activity limitations, pain, anxiety, and general poor health. These health related quality of life variables were augmented by a list of poor health behaviors engaged in more often by those with insufficient sleep. Strine and Chapman (2005) reported more poor health behaviors, including smoking, drinking heavily, and being more physically inactive and obese.

It is conceivable that these negative health outcomes and increased poor health behaviors interact to result in compounded negative health effects. From a medical perspective these health effects can extend to disruptions in adrenomedullary activity, metabolism, hematological and immunological changes, adrenocortical activity changes, epilepsy, and autonomic nervous system activity alterations (Naitoh, Kelly, and Englund, 1990). Perhaps the most interesting relationship between sleep and health is that it is bi-directional, which serves to create a cyclical battle between poor sleep causing health conditions and health conditions causing poor sleep that only ceases at death. Several of these conditions have begun to be studied in depth in the general adult population and among children, including the relationship between sleep and body weight, sleep and chronic conditions, and sleep and mental health conditions. Extending the examination of health related predictors of sleep and outcomes of sleep into the emerging adult population may highlight areas of prevention that could ward off future health disparities related to poor sleep across the lifespan in adults. The college campus is one location where the emerging adult population may easily be studied, and a large percentage of the population may be reached for behavior change programing to promote better sleep quality.

Weight

Body weight also has a unique relationship to sleep as it has been found to be both a cause and a result of poor sleep. First, suboptimal sleep has been associated with weight gain in several populations. Patel et al. (2006) identified through the Nurses' Health Study following 68,183 for 16 years that women sleeping 5 hours or less and 6 hours or less gained 1.14 kg and 0.71 kg respectively compared to those sleeping 7 hours. The heightened weight gain among those sleeping five hours or less compared to six or less represents the exponential effects of inadequate sleep. Both groups of women were at a significantly higher risk for a 15 kg weight gain and a body mass index greater than 30 kg/m^2, even after controlling for over a dozen covariates such as age, smoking, menopausal status, medication use, physical activity or diet. Patel et al. (2006) discussed that hypothalamic pituitary functions that influence energy balance, metabolism, and eating, which are associated with circadian rhythms and sleep regulation, may be one explanation. It was also suggested that reduced sleep may result in reduced basal metabolic rate, increased caloric intake, or that fatigue related to limited sleep may reduce physical activity resulting in a lower caloric burn throughout the day. However, the survey did not examine voluntary physical activity, which may help to explain the relationships and should be examined. Another set of researchers found similar weight gains among a large sample of women with sleep less than seven hours per night across ten years, however the results were not significant (Gangwisch, Malaspina, Boden-Albala, & Heymsfield, 2005). Considering these two studies together it should be concluded that further research is necessary to clarify the risk and the potential causes of weight gain for women receiving less than seven hours of sleep per night.

When men have been considered, similar results have been found. Chaput, Després, Bouchard, and Tremblay (2008) extended the knowledge of the association between weight and

sleep among women to men. Among adults in the Quebec Family Study both short (5 to 6 hours) and long (9 to 10 hours) sleep durations lead to weight gains (1.98 kg and 1.58 kg respectively) compared to average sleep duration (7 to 8 hours) among both men and women adjusting for age, sex, and baseline body mass index. Among the 276 adults (117 men and 159 women) short duration sleepers were 35% more likely and long duration sleepers were 25% more likely to have a 2 kilogram weight gain across 6 years. The risk of the development of obesity was at 27% and 21% for short and long duration sleepers respectively. Both of these findings continued to be statistically significant after controlling for the covariates as well as physical activity and caloric consumption. To better understand the potential for sleep related obesity issues in the emerging adult, an evaluation of the relationships beyond adults and into the youth population is important.

Children have been targeted for evidencing the effects of short sleep duration on obesity as well. Recently, Cappuccio et al. (2008) completed a meta-analysis of 36 epidemiological study samples examining the relationship of short sleep duration and obesity among both children and adults. The results showed that the cross-sectional studies from around the world consistently exposed an increase risk for obesity among both children and adults with short sleep durations (less than 10 and 5 hours respectively). One inconsistency that was found however among the studies was the lack of control for confounding variables and temporal sequence, presenting the transition into the difficulty of determining causality. Leading then the discussion of how obesity itself may cause suboptimal sleep. A similar review completed by Patel and Hu (2008) found that among 36 publications on children and adults, that both the cohort and cross-sectional studies consistently show a strong association between short sleep duration and both future and concurrent obesity risk. Twenty-three studies were cross-sectional, of which 17

revealed an association between increased weight and short sleep duration that was independent. Finally, three of the studies were longitudinal, and indicated a positive association between short sleep duration and future weight status. An interesting conclusion from the overall review was that the relationship between short sleep duration and increased weight seems to diminish with age. Considering some of the proposed metabolic and behavioral explanations for the relationship, this may indicate that a great emphasis needs to be placed on examining these variables in younger populations, as well as populations transitioning into adulthood. Understanding such research in conjunction with that found in adults will be important for interpreting the effects of sleep on obesity related factors, such as chronic disease.

Chronic Disease and Illness

Much research has been completed in clinical areas identifying the sleep statuses and interventions among populations with chronic diseases such as diabetes, chronic obstructive pulmonary disease, Parkinson's, multiple sclerosis, renal disease, and rheumatoid arthritis. These studies provide valuable detailed knowledge for clinical practitioners, while broader views of the associations between sleep problems and chronic disease may be more valuable for health educators and promoters, or those seeking to prevent chronic disease and illness. In fact, there is growing evidence of the relationship between health and sleep, meaning that identification of sleep disorders could lead to improved quality of life in general, as well as management of chronic conditions for patients (Reid et al., 2006). Currently, most clinical evaluations fail to include questions regarding sleep as a component (Reid et al., 2006), making pertinent the need for education and promotion around the matter at both lay and professional levels.

Foley, Ancoli-Israel, Britz, and Walsh (2004) assessed the relationship between sleep disturbances and chronic disease through the 2003 National Sleep Foundation Sleep in America

Survey. The study included 1506 randomly selected women and men aged 55 to 84 who completed a telephone interview. A larger portion of participants, 83%, identified themselves as having one of 11 medical conditions, and 1 in 4 of those older than 65 identified themselves as having 4 or more of the conditions (classified as major comorbidity). The conditions included heart disease, hypertension, arthritis, diabetes, cancer, stroke, lung disease (such as asthma, chronic bronchitis or emphysema), depression, osteoporosis, memory problem, bodily pain, obesity, and enlarged prostate. Of the chronic conditions, diabetes, arthritis, lung diseases, stroke, osteoporosis, and obesity were associated with sleep related problems including snoring, restless legs, breathing pauses, daytime sleepiness and less than six hours of sleep per night (insufficient sleep). Other conditions were more associated with general symptoms of insomnia, including depression, bodily pain, memory problems, and heart disease. These differences are noteworthy, for those conditions resulting in general insomnia are primarily psychological, while those resulting in more physiological sleep disruption symptoms are primarily physiological conditions. This may detail the importance of psychological health and wellbeing, such as perceptions of pain and depression status, relationships to sleep. The conditions of hypertension, cancer, and enlarged prostate did not show association with sleep problems. Overall, only 10% of respondents without medical conditions perceived their sleep quality as poor or fair. However, 40% of respondents with major comorbidities perceived their sleep quality to be poor or fair. Despite the possible biases and low response rates of a telephone based survey the research found that there is a strong association between many chronic diseases and sleep disturbances and insomnia. Interestingly, the study controlled for age among other demographic variables in both chi-square and stepwise multiple logistic regression, concluding that the sleep complaints were a factor secondary to their chronic disease, and not aging. This finding related

to that found by obesity researchers, that obesity risk with poor sleep is highest for younger populations; therefore, if prevention and awareness of sleep importance in youth can lead to better sleep across the lifespan, obesity and its related chronic conditions may be minimized, thus improving the sleep of adults by reducing risks for chronic disease and illness that may cause poor sleep.

Interventions to Improve Sleep

The interventions often promoted to improve sleep revolve around three areas, pharmacological, exercise, and cognitive behavioral therapies. Prescription and over the counter sleep aids are among the highest used and abused drugs in the United States (Lessenger & Feinberg, 2008), and while effective as a pharmacological treatment, may only promote more sleep problems due to the high psychological and physiological concerns of tolerance and dependence. Exercise for sleep promotion may raise core body temperature and promote relaxation to help initiate and maintain sleep, but while it has been found to be mostly effective in older adults (Montgomery & Dennis, 2009), there are wide differences between exercise protocols studies and individual characteristics that cloud the evidence of effectiveness, leaving the true efficacy of exercise as a sleep promotion tool to still be established for both normal sleepers and clinical populations (Driver & Taylor, 2000). Finally, cognitive behavioral techniques have been shown to benefit 70% to 80% of patients by the American Academy of Sleep Medicine in a review of 48 clinical trials and 2 meta-analyses (Morin, Hauri, Espie, Spielman, Buysee, & Bootzin, 1999). Stimulus control, progressive muscle relaxation, paradoxical intention, sleep restriction, biofeedback, and multifaceted cognitive-behavior therapy have been found to be effective (Morin et al., 1999), however, others such as sleep hygiene education, imagery training, and cognitive therapy have yet to acquire adequate support and need

further study (Chesson et al., 1999). Considering the risks of pharmacological therapies alternates such as exercise and cognitive behavioral techniques should be studied further for efficacy and promoted for less than severe cases of chronic insomnia.

College Students and Sleep

While almost 10% of Americans experience chronic insomnia, more than one-quarter report occasionally not getting enough sleep (Reite, Ruddy, & Nagel, 2002). A smaller portion of the population, college students, may experience a unique situation related to sleep. Hicks and Pellegrini (1991) summarized research from a 20 year period among 7,958 college students, and found that similar to the general population, college students median hours of sleep had dropped by one hour during the time span. These data also suggested that students are becoming more dissatisfied with their sleep, with the number of dissatisfied students doubling from 1978 to 1988 (Hicks, Mistry, Lucero, Lee, & Pellegrini, 1989). These data were then updated in 2001 using 9,543 students to include another decade, and the additional 10 years resulted in more than an hour decline in median hours per sleep across 30 years total from 7.75 hours in 1969 to 6.65 hours in 2001 (Hicks, Fernandez, & Pellegrini, 2001). These durations are in comparison to the suggested 8.5 to 9.25 hours for the typical beginning college student of 18 to 19 years, and 7 to 9 hours for the older college student. Both groups hypothetically may need to be toward the higher end of the ranges as well, considering the academic and other demands placed on them that require memory integration. The overall question is what factors are leading to this reduced sleep duration, how is sleep quality affected, and whether or not it impacts the health and wellbeing of the emerging adult in a negative manner.

The body of literature related to college students' sleep, health outcomes, behaviors, and determinants has only recently begun to solidify further. As cited, a recent editorial by Wolfson

(2010) on adolescents' and emerging adults' sleep patterns expressed that while an understanding of adolescent sleep and the consequences of it is beginning to form, questions are still arising, and one such area is sleep difficulties in older adolescents or emerging adults. Wolfson (2010) highlighted how Lund et al. (2010) described how few studies of careful design have been able to articulate or capture emerging adults' or college age adolescents' changing sleep patterns. Wolfson (2010) described the end of adolescence as marked by a "complexity of physical, psychological, social, and cognitive measures", and at this time there is an abrupt shift in sleep schedules at roughly age 20 (Roennberg et al., 2004). This is in accordance with a transition to college at roughly age 18 and time spent there into the early or mid-twenties. As expressed by Wolfson (2010) in the editorial, researchers, educators, and health care providers need to better understand sleep and its developmental trajectory over the late adolescence and emerging adulthood years through more research to better serve the health of our nation. Research is trending to show that sleep in this population indeed should be addressed.

In clinical terms, Gaultney (2010) found that among 1,845 students surveyed using the SLEEP-50 consisting of 50 items that measure sleep characteristics, over 500 were at risk for at least one sleep disorder. The American College Health Association (ACHA) obtained survey results that indicated college students have long sleep latencies, frequent night waking, and short sleep time (ACHA, 2005). Forquer, Camden, Gabriau, and Johnson (2008) mirrored the ACHA's findings in a smaller sample of 313 students, where 33% took longer than 30 minutes to fall asleep, 43% woke more than once during the night, and one-third reported being tired during the day. Steptoe, Peacey, and Wardle (2006) similarly found that among a larger sample of 17,465 university students from 27 universities across the globe that only 63% reported adequate sleep, 21% reported less than 6 hours a night, and 16% reported more than 8 hours.

Consequently, the self reported health data showed that respondents with inadequate sleep had significantly poorer health. In addition to the well documented negative health outcomes that result from inadequate sleep, college students are in a unique situation where their life adjustment and educational performance are affected (Buboltz, Brown, & Soper, 2001), factors that are representative of the physical, psychological, social, and cognitive measures (Wolfson, 2010) that change during transition into adulthood. Therefore, it was recommended that universities and college authorities acknowledge the sleep habits and patterns of students' through educational programs and interventions (Buboltz et al., 2001), in addition to these habits being researched. One such way to do so is to examine what factors predict poor sleep quality in the population, and then developing campus initiatives to address the factors.

Prevalence of Suboptimal Sleep in College Students

Much like young adolescent, older adults, and clinical populations, research that has been completed among emerging adults has found similar trends of health and wellness correlates with poor sleep. In relation to both physical health, mental health, and wellness, it has been reported that among college students completing a seven day sleep log, sleep quality was more related to health, affect balance, feelings of tension, anger, depression, fatigue, and confusion, as well as satisfaction with life, rather than sleep quantity (Pilcher et al., 1997). These findings remained consistent when repeated at the two month and three month mark, expressing that sleep quality is a consistent and important correlate to consider for daily health and wellbeing (Pilcher & Ott, 1998). In relation to just mental health, a study of 340 female and 298 male Mexican college students found that 31% of students had a high level of sleepiness, and those students with depressive symptoms significantly rated their sleep quality as poor, perceived a greater latency to initiate sleep after going to bed, and more awakening at night

(Moo-Estrella, Pérez-Benítez, Solíis-Rodríguez, & Arankowsky-Sandoval, 2005). These students also had greater somnolence during class and perceived that it affected their academic performance at significnatly higher levels than students without depressive symptoms.

Moo-Estrella et al. (2005) concluded that sleep hygiene education and encouragement for students to seek professional advice for sleep disturbances may help to prevent depression. Prior to this research, as early as 1998, the correlation between negative mood states and sleepiness in the measure of falling asleep during class was reported (Jean-Louis, Gizycki, Zizi, & Nunes, 1998). Additional correlates in this relationship to those falling asleep in school reporting higher negative mood states were men having higher negative moods, and students falling asleep also consuming more alcoholic beverages and smoking more. These behavioral correlates are consistent with prior research between sleep, alcohol use, and tobacco use.

Another psychological variable, worrying, especially about relationships, as well as lack of confidence, aimless futures, work, and finances, has been found to be associated with decreased sleep duration in college students (Kelly, 2003). Worry is often highly associated with stress, which also correlates with sleep. In 1999, Verlander, Benedict, and Hanson (1999) measured three domains of stress (environmental events, personality mediators, and emotional responses) and sleep in 227 college students. Environmental event stress was significantly related to difficulties waking up, emotional response stress significantly to depth of sleep, difficulties waking up, quality and latency of sleep, negative affect in dreams, length of sleep, and sleep irregularity, and personal mediators significantly to difficulties waking up.

In relation to academic achievement, a goal of many emerging adults enrolled in college, sleep, primarily wake-up times, followed by bedtimes, and hours of sleep on weekends, have been found to explain the largest amount of variance in grade point average when compared to

30 other correlates (Trockel, Barnes, & Egget, 2000). Other factors with significant correlations that help explain variability in grade point average are study of spiritually oriented material, eating breakfast, use of a planner, age, and gender (Trockel et al.,2000). The same research did not find exercise, other eating behaviors, psychological wellness behaivors, or social support to have significant effects (Trockel et al., 2000). Additionally, simple cognitive tasks are affected by sleep deprivation. Pilcher and Walters (1997) found that among 44 college students, after either 8 hours of sleep or 24 hours of sleep deprivation, that deprived students performed significantly worse on a cognitive task. Interestingly however, the sleep deprived students rated their performance as significantly higher than students who had an appropriate night's sleep. This task mirrors the common activity among college students of "pulling all nighters" to cram in studying for examinations, however as this research shows, sleep deprivation negatively affects cognitive tasks and students are not aware of the reduced performance. This is further evidenced by the finding that in general, students with shorter sleep durations have significantly lower reported overall grade point averages than long sleepers (Kelly, Kelly, & Clanton, 2001).

Behaviors Associated with Sleep in College Students

Many health behaviors such as alcohol consumption, smoking, and sedentary lifestyles are linked with inadequate sleep in the general population (Bixler, 2009). A primary example of how these issues transcend into the emerging adult population is alcohol use. Singleton and Wolfson (2009) found that among 236 students at a liberal arts college, that alcohol consumption significantly predicted the duration of sleep, timing of sleep, differences between weekday and weekend nighttime sleep hours, and differences between weekday and weekend bedtime hours. Additional predictors of reduced sleep quality in the college student population are behaviors related to academic and emotional stressors common in the context of student life (Lund et al.,

2010). On the flip side, sleep difficulties have also been found to be a significant predictor of stress among residential college students (Dusselier, Dunn, Wang, Shelley, & Whalen, 2010). Also, there are behaviors and related stressors that may hinder sleep, and that college students are uniquely at risk for, include inadequate time management and participation in multiple activities such as employment, volunteer work, athletics, and social circles (Brown, Buboltz, & Soper, 2006). In light of these factors that may influence students' sleep it is important to consider the opportunities that may be utilized to overcome poor sleep schedules and behaviors associated with sleep, including sleep hygiene education.

College Students and Sleep Hygiene

A few universities have tried interventions to improve sleep, and those that have emphasize the need for education on good sleep hygiene, although it has not been clearly established to help change behavior yet (Gaultney, 2010), nor has it been done directly. Tsai and Li (2004) measured the effects of a two credit sleep management course on 241 students sleep hygiene, which did result in improved sleep quality but not sleep patterns, therefore a mild effect. Brown, Buboltz, and Soper (2002) did find that sleep hygiene impacts sleep-related behaviors in students through increased knowledge, which transfers into better sleep quality. This finding was mirrored by Linden (2010) and Harris (2009). The discrepancies may be due to not accounting for underlying sleep disorders needing treatment, not just education, and further sleep education research should be tested for effectiveness among students with no apparent risk for a sleep disorder (Gaultney, 2010). According to Gaultney (2010), if this is accurate, sleep habits in students become critical to college success.

Several categories of determinants relate to inadequate sleep behaviors as previously discussed. Of those, behavioral and environmental determinants are categories that consist

primarily of items related to sleep hygiene (Monk, Buysse, Rose, Hall, & Kupfer, 2000). Traditionally, "sleep hygiene (SH) refers to a list of behaviors, environmental conditions, and other sleep-related factors that can be adjusted as a stand-alone treatment or component of multimodal treatment for patients with insomnia" (Stepanski & Wyatt, 2003). By definition, sleep hygiene is modifiable and the behaviors and conditions associated with it as a determinant to sleep can be changed to improve sleep quality and the resulting health-related quality of life. Advice related to improving sleep hygiene is limited in the peer-reviewed literature, however it is common among literature related to the medical practice and lay health advice. For example, the University of Maryland Medical Center (2010) has provided an online resource titled *Helpful Hints to Help You Sleep*.

The resource addresses each of the following determinants of sleep. First, personal habits can be changed. By fixing a bedtime and an awakening time schedule, avoiding napping during the day, avoiding alcohol, caffeine, and heavy, spicy, or sugary foods four to six hours before bedtime, as well as exercising regularly, but not right before bed, sleep quality can be improved. Second, by shaping your sleep environment with comfortable bedding, a comfortable temperature, blocking out all distracting noise, reserving the bed for sleep and sex, and removing the television from the bedroom sleep quality can be improved. Third, making getting ready for bed a process through eating a light snack, practicing relaxation techniques, learning to leave worries at the bedroom door, establishing a pre-sleep ritual, and getting into your favorite sleep position can improve sleep quality. Finally, the center also acknowledges that other factors influence sleep hygiene such as physical and psychological health conditions and medications, which may best be addressed through medical treatment. These suggestions may be useful to apply to the college population, who imaginably may experience poor sleep hygiene due to

roommates, loud dormitories or apartments, distractions of the college experience, and behaviors of the college experience.

This description of sleep hygiene could be expanded to include change in other behaviors and conditions in an intervention on college campuses to promote sleep for the emerging adult population. Additions could possibly include addressing alcohol, tobacco, and other drug use in general, the living environments of students, physical activity promotion, depression, anxiety, stress, and possibly specific groups of students if it can be determined that certain characteristics such as these indeed are related to sleep quality in the population as tested in a model. Most recently Davidson (2012) began to model such relationships finding evidence to support that emotional and physical functioning, number of hours per week worked, living situation, age, hours of involvement in extra-curricular activities, number of leadership positions, relationship status, drinks consumed per week, cigarettes smoked per week, veteran status, and volunteering may impact sleep related outcomes such as sleep quality, weekend sleep length, and weekday sleep length. Davidson (2012) concluded with recommendations that continued initiatives to collect data on factors that may impact college student's sleep quality are needed.

Theoretical Frameworks

The use of theoretical frameworks in both the emerging adult population and the general population concerning improving sleep is limited. However, considering the multiple determinants of sleep it is important to consider theoretical models for testing determinants and constructs related to sleep behaviors and outcomes. Several individual level theories may be of use. First, the Theory of Planned Behavior (TPB) and related Integrated Behavioral Model may help address students' attitudes, perceived norms, and personal agency through constructs such as perceived control over sleep, normative beliefs, and self-efficacy as they relate to sleep. This

theory has been utilized several times previously to address students' sleep hygiene and sleep quality. Linden (2010), examined the associations with levels of perceived support, public attitudes regarding the importance of sleep, and health self-efficacy. Self-efficacy and attitude best predicted sleep hygiene, while self-efficacy alone best predicted sleep quality. Results also indicated that sleep is undervalued as leading to negative health outcomes. Knowlden (2011) also used the TPB, finding that perceived behavioral control, subjective norm, and attitude toward the behavior accounted for 36.2% of the variance in behavioral intention to have adequate sleep duration of 7 to 8 hours. Thus, concluding that the TPB is a beneficial theoretical framework to use in designing sleep health education and promotion interventions in undergraduate students (Knowlden, 2011). The Health Belief Model (HBM) is another that may address some issues surrounding sleep. It may be used to address perceived susceptibility of poor health outcomes related to sleep, perceived severity of those outcomes, perceived benefits of sleep, perceived barriers to sleep, cues to action to engage in positive sleep behaviors, and self-efficacy for taking action to improve sleep. A last individual level theory that may be used to address factors such as decision balance between studying or going out and sleeping, self-efficacy, and process change related to sleep is the Transtheoretical Model (TTM). While both the HBM and the TTM have been used in populations with sleep apnea (Aloi, Arnedt, Stepnowsky, Hecht, & Borrelli, 2005; Olsen, Smith, Oei, & Douglas, 2008), they have not been used to address healthy sleepers. Finally, it may be of additional advantage to consider interpersonal and/or community based theories in conjunction with individual level theories in the college setting considering the highly social and networked environment. Utilizing a combination of different levels of theories will support addressing variables through health education and promotion that may be found as predictors of sleep quality in the emerging adult

population, for it seems clear that a model explaining sleep related outcomes in the population should address factors related to both the individual themselves and the large context in which they live.

Summary

Overall, there is a broad range of lay knowledge on sleep determinants and behaviors, and a strong foundation on sleep and health in the general population. However, there is limited peer-reviewed literature pertaining to the like in the college student, emerging adult, population, and no published models of sleep quality for the population. The mere fact that the college experience gives way to behaviors and environmental situations non-conducive to sleep and health calls for the need to examine such through sound research. Additionally, a call to do so in the emerging adult population has been expressed. Since there have been limited studies on this relationship it is suggested that sleep among college students and the resulting health outcomes be examined through an exploratory viewpoint, which may lead to suggestions for further research and practice. Evidence for a model explaining predictors of sleep quality in the population may be utilized to develop best practices for education and promotion of sleep quality in the population to prevent future health disparities.

Chapter III

Methods

Purpose

The purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the population as measured by the American College Health Association's National College Health Assessment-II.

Research Design

The study was designed to analyze secondary data of the National College Health Assessment-II results obtained from students at the participating university during the spring semester of 2011. Original data collection utilized a cross-sectional survey research design. Cross-sectional research is that which is collected at a single point in time (Johnson & Christensen, 2008). The sampling procedure used was proportional stratified sampling, a method in which characteristics are selected from an available sample in exact proportion to their representation in the population (Johnson & Christensen, 2008). The research was also nonexperimental, as it did not manipulate the independent variable or utilize random assignment to more than one group (Johnson & Christensen, 2008). The design was best suited to the study because it provided ease of obtaining a satisfactory amount of generalizable survey based data to describe the current state of sleep in the population and potential predictor variables of sleep as measured by recall on survey items. Overall, this type of causal comparative research is a good fit for descriptive research, such as the current study, because it allows the research to study relationships between multiple independent categorical variables at the same time as quantitative dependent variables (Johnson & Christensen, 2008). In the current study this allowed the

comparison of variables such as demographics, health behaviors, and health status at the same time to examine the relationships between such variables and dependent sleep related outcomes.

Subject/Site Selection Procedures

The research site for the original study was classrooms at the University of Kansas. The participants were selected by the University of Kansas' Health Education Resource Office (HERO) located in Watkins Memorial Health Center. The HERO staff conducted a series of steps to select classes to survey. First, the American College Health Association communicated the recommended sample size of 1500 students to obtain a representative sample, taking into account an imperfect response rate. Second, the 20th day reports through the Office of Institutional Research and Planning (OIRP) website were obtained (Appendix B). These reports provide information on the number of students and demographics on campus in total. A formal request to the OIRP resulted in a compilation listing both graduate and undergraduate courses that had the highest number of enrollees and whose enrolled students fulfill the following demographic requirements in a manner that reflected the university in a generalizable manner: level in school (freshman, sophomore, junior, senior), graduate versus undergraduate, sex, ethnicity (White, Black, Hispanic, Asian, American Indian, Pacific Islander, Two or More Races, Not Specified), international students, full-time or part-time. The OIRP provided the HERO with a list of approximately 330 courses with the highest enrollment, and a worksheet containing formulas to calculate the numbers of the demographic requirements by percentages. Classes were entered into the formula to select a cluster of classes that was demographically representative of the university and suggested sample size.

While the student data were being obtained an application was submitted to the Human Subjects Lawrence Committee for project approval (Appendix C), and a request was made to the

Director of Student Health Services to allow the Director of the Health Education Resource Office to be granted special Principle Investigator status for the project. After approval an order was placed to the American College Health Association for the number of surveys needed for the survey period. Also, a request for participation by email (Appendix D) was disseminated from the Health Education Resources Office and the Interim Sr. Vice Provost for Academic Affairs to the prospective professors and lecturers whose classes were selected in the initial course selection process.

Depending on the response of each individual course professor or instructor either a date for the survey to be completed in the class was scheduled, or an alternate course was selected that would similarly meet the demographics. This process was continued until the number of recommended participants meeting the demographic makeup of the university student body was secured.

In the secondary analysis the participants sampled were limited to undergraduate students, ages 18 to 23, identifying as male or female. This age group best fits the description of the emerging adult population.

Data Collection Procedures

The Health Education Resource Office staff conducted survey data collection. The data collection in each class included an opening remark about the purpose, handing out the surveys, and remaining available to students in the event they had a question or concern. As addressed in the information statement provided with the survey anyone could decline participation at any time. The survey took approximately 25 minutes to complete, and students were instructed to place their completed surveys in a collection box. During the data collection period mini Cliff Bars were available for students to take as an incentive. The bars were provided as a donation

from the company to the university to provide as a healthy snack at events. Once all surveys had been completed for each course a lid was placed on the collection box and returned to the Health Education Resource Office for secure storage. This process was replicated until all classrooms were visited.

After completion of the survey data collection, the Health Education Resource Office staff reviewed each anonymous survey to ensure the greatest number of usable surveys. This was done by removing blank or partial surveys, and confirming that all bubbles were completely darkened and any lines that went outside the bubbles were erased. An Institution of Higher Education Demographic Survey (Appendix E) of the entire university was also returned with the surveys as requested by the American College Health Association.

Testing Instruments

National College Health Assessment – II. The National College Health Assessment – II (NCHA-II) developed by the American College Health Association (ACHA, 2005) is a 65 question survey that explores the health of college students. The survey is a way to collect data on a range of health habits, behaviors, and perceptions. The National College Health Assessment-I (ACHA, 2005) was developed by an interdisciplinary team of health professionals from colleges and pilot tested in 1998-1999. The Center for Disease Control and Prevention's National College Health Risk Behavior Survey (NCHRBS), Student Health Survey, Core Alcohol and Drug Survey, College Alcohol Study (CAS), Annual Student Health Behavior Assessment, Monitoring the Future Study, and the National Health Objectives outlined by Healthy People 2000 were reviewed and used as a foundation for development of the survey. The ACHA –I was piloted and the NCHRBS, CAS, and the National College Women's Sexual Victimization Study (NCWSV) were used to conduct reliability and validity analyses (ACHA,

2005). Findings showed average interitem correlation coefficients, consistent standardized alphas, similar correlation coefficients on construct validity, and similar odds ratios on measurement validity analyses using multiple variable logistic regression analysis (when compared with the NCHRBS, NCWSV, and CAS respectively) (ACHA, 2005). The survey was updated in 2007 to the ACHA-II (Jackson, 2008).

A subset of questions from the original survey was utilized in a secondary analysis for the current study to describe and conceptualize the health status, behavioral, and demographic predictors of sleep quality in college students. The subset is identified as the following.

Demographics. Demographics utilized in the current analysis resulted from nine questions from the NCHA-II and were used to identify the sample population's characteristics and as variables in the hypothesized causal model of sleep quality in the sample. Demographics included age, gender (female, 0, versus male, 1), year in school (1^{st}, 2^{nd}, 3^{rd}, 4^{th}, or 5^{th} year or more undergraduate, score as respective number), enrollment status (part-time or other, 0, versus full-time, 1), ethnicity/race (Black or African American, Hispanic or Latino/a, Asian or Pacific Islander, American Indian, Alaskan Native, or Native Hawaiian, Biracial or Multiracial, and Other, scored as 0, White, scored as 1), current living arrangement (on campus housing in residence hall or other college/university housing, scored as 1, versus off campus or greek housing scored as 0, and fraternity or sorority housing scored as 1, versus any other on campus housing and off campus housing, scored as 0), hours worked per week for pay (0 hours, 1-9 hours, 10-19 hours, 20-29 hours, 30-39 hours, 40 hours, more than 40 hours, scored as 1, 2, 3, 4, 5, 6, and 7 respectively), hours volunteered per week (0 hours, 1-9 hours, 10-19 hours, 20-29 hours, 30-39 hours, 40 hours, more than 40 hours, scored as 1, 2, 3, 4, 5, 6, and 7 respectively),

and varsity college athletic participation in the past 12 months (club sports, intramurals, and none, scored as 0, versus varsity, scored as 1).

Sleep related demographics. Sleep related demographics included six questions from the NCHA-II that described knowledge, outcomes, and experiences related to sleep quality, and were used to describe the sample population's current state of sleep and as variables in the hypothesized causal model of sleep quality in the sample. The questions were as follows:

Have you received information on the following topics from your college or university: sleep difficulties? (Response options were: No, scored as 0, or Yes, score as 1);

Are you interested in receiving information on the following topics from your college or university: sleep difficulties? (Response options were: No, scored as 0, or Yes, score as 1);

Within the last 12 months,

1. have you been diagnosed or treated by a professional for Insomnia or other sleep disorder (2 questions combined)? (Response options were: No, scored as 0, or Yes, diagnosed but not treated, Yes, treated with medication, Yes, treated with psychotherapy, Yes, treated with medication and psychotherapy, and yes, other treatment, scored as 1);
2. have any of the following been traumatic or very difficult for you to handle: Sleep difficulties? (Response options were: No, scored as 0, or Yes, scored as 1); and
3. have any of the following affected your academic performance: Sleep difficulties? (Response options were: This did not happen to me/not applicable and I have experienced this issue but my academics have not been affected, scored as 0, or Received a lower grade on an exam or important project, Received a lower grade in

the course, Received an incomplete or dropped the course, and Significant disruptions in thesis, dissertation, research or practicum work scored as 1).

***Sleep quality*.** Sleep quality was measured by six questions from the NCHA-II, which were used to describe the sample population's current state of sleep and as variables creating a latent sleep quality variable in the hypothesized causal model of sleep quality in the sample. The questions were as follows:

On how many of the past 7 days did you get enough sleep so that you felt rested when you woke up in the morning? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, or 7 days);

In the past 7 days, how often have you awakened too early in the morning and couldn't get back to sleep? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, or 7 days);

In the past 7 days, how often have you felt tired, dragged out, or sleepy during the day? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, or 7 days);

In the past 7 days, how often have you gone to bed because you just could not stay awake any longer? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, or 7 days);

In the past 7 days, how often have you had an extremely hard time falling asleep? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, or 7 days); and,

In the past 7 days, how much of a problem have you had with sleepiness (feeling sleepy, struggling to stay awake) during your daytime activities? (Response options were: No problem at all, A little problem, More than a little problem, A big problem, A very big problem, scored as 1, 2, 3, 4, and 5 respectively).

Health status indicators. Health status indicators utilized for the current study were measured by five questions from the NCHA-II, and were used to describe the sample population's current state of health and as variables in the hypothesized causal model of sleep quality in the sample. The questions included:

How would you describe your general health? (Response options were: excellent, very good, good, fair, or poor, scored as 1, 2, 3, 4, and 5 respectively);

Within the last 12 months, how would you rate the overall level of stress you have experienced? (Response options were: no stress, less than average stress, average stress, more than average stress, tremendous stress, scored as 1, 2, 3, 4, and 5 respectively);

Body Mass Index (BMI), as measured by height in feet and inches and weight in pounds items from the survey and computed by the ACHA. The equation is as follows:

$BMI = KG/ m^2$; and

Within the last 12 months, have you been diagnosed or treated by a professional for depression or anxiety (2 questions combined)? (Response options were: No, scored as 0, or Yes, diagnosed but not treated, Yes, treated with medication, Yes, treated with psychotherapy, Yes, treated with medication and psychotherapy, and yes, other treatment, scored as 1).

Health behaviors. Health behaviors were measured by 20 questions from the NCHA-II, and were used to describe the sample population's health behaviors and as variables in the hypothesized causal models of sleep quality in the sample. The questions included:

Within the last 30 days, on how many days did you use tobacco (Cigarettes, Tobacco from a water pipe (hookah), Cigars, little cigars, clove cigarettes, or Smokeless tobacco, 4 questions combined)? (Response options were: never used and have used, but not in last 30 days

scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, used daily scored as 1);

Within the last 30 days, on how many days did you use alcohol? (Response options were: never used and have used, but not in last 30 days scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, used daily scored as 1);

Within the last 30 days, on how many days did you use marijuana? (Response options were: never used and have used, but not in last 30 days scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, and used daily scored as 1);

Within the last 30 days, on how many days did you use illicit stimulants? (Cocaine, Methamphetamine, or Other amphetamines, 3 questions combined) (Response options were: never used and have used, but not in last 30 days scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, and used daily scored as 1);

Within the last 30 days, on how many days did you use illicit depressants? (Sedatives, Opiates, or Inhalants, 3 questions combined) (Response options were: never used and have used, but not in last 30 days scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, and used daily scored as 1);

Within the last 30 days, on how many days did you use other illicit drugs? (Hallucinogens, Anabolic steroids, MDMA, Other club drugs, or Other illegal drugs, 5 questions combined) (Response options were: never used and have used, but not in last 30 days scored as 0, response options of 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, and used daily scored as 1);

Over the last two weeks, how many times have you had five or more drinks of alcohol at a sitting? (Response options were: N/A, don't drink, and none scored as 0, response options of 1

time, 2 times, 3 times, 4 times, 5 times, 6 times, 7 times, 8 times, 9 times, 10 or more times scored as respective number of times); and

Cardiovascular physical activity guidelines as defined by the American College of Sports Medicine and the American Heart Association (Haskell et al., 2007) (Moderate-intensity cardio or aerobic exercise for at least 30 minutes on 5 or more days per week, or vigorous-intensity cardio or aerobic exercise for at least 20 minutes on 3 or more days per week) met or not met, scored as 1 and 0 respectively, as measured by 2 questions. These questions were:

1. On how many of the past 7 days did you do moderate-intensity cardio or aerobic exercise (caused a noticeable increase in heart rate, such as a brisk walk) for at least 30 minutes? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days); and
2. On how many of the past 7 days did you do vigorous intensity cardio or aerobic exercise (caused large increases in breathing or heart rate, such as jogging) for at least 20 minutes? (Response options were: 0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days).

Data Analysis and Hypothesis Testing

Surveys were returned to the American College Health Association in May, 2011 for electronic tabulation. After tabulation, the American College Health Association returned a reports package to the Health Education Resource Office in November of 2011, which included the results of the overall survey, and those for freshmen, sophomore, junior, senior, and graduate/professional student subgroups.

The current study utilized descriptive statistics, as analyzed by Statistical Package for Social Sciences (SPSS) version 20, to describe the mean of responses to items. R, a statistical

software, was utilized to conduct structural equation modeling to analyze the hypothesized causal connections between the demographic, health status, and health behavior variables on sleep quality as constructed through factor analysis by combining sleep quality questions. R was also used to re-estimate the model to find a best-fit model. Full information maximum likelihood (FIML) was used as the default method to handle missing data in R. A structural equation model (SEM) is a type of statistical technique that examines the covariation among observed variables to reduce the number of observed variables into fewer latent, unobserved, constructs and test the fit of a model through confirmatory factor analysis (CFA) (measurement model) and multiple regression (structural model) (Schreiber et al., 2006).

In SEM the measurement model conducts the confirmatory factor analysis to test the theory that there are relationships between the observed variables that combine into fewer unobserved latent constructs by comparing the estimated population covariance matrix with the observed covariance matrix (Schreiber et al., 2006), in this case response to sleep quality indicator questions creating an unobserved sleep quality construct. The structural model in SEM explains the effects, both direct and indirect, of observed variables on latent constructs in a hypothesized model through simultaneous multiple regressions (Schreiber, 2008). The SEM therefore is essentially the extension of a path analysis as the structural model that includes latent constructs as measured by CFA in the measurement model. In the hypothesized structural model variables may be exogenous, or strictly independent variables, that are not explained by other variables in the same model, or endogenous variable, independent and dependent, that are regressed on one or more variables in the model and may mediate the relationship between other variables (Geiser, 2012). Both types of variables may be observed or unobserved depending on the model (Schreiber et al., 2006). Essentially, a path model hypothesizes that one variable is the

cause of another (Kline, 2011), and allows for simultaneous measurement of the relationships between all variables in the model. Path analysis is suited as it is a "better choice for the explanatory analysis of nonexperimental data", as is the case in the current study, when compared to other options such as multiple regression (Keith, 2006, p. 213). While causation cannot be inferred with path analysis, theory and previous literature on sleep can provide support to draw such inferences (Keith, 2006). The utilization of time precedence in path analysis, where all predictor variables occur previously, and a few concurrently make it easier to draw such conclusions from the model (Keith, 2006). Overall, SEM allows a researcher to test how variables or constructs, both observed and unobserved, are linked and the direction of significant relationships within a model.

The proposed model in the current study included 23 variables predicting the latent variable sleep quality as estimated by responses to the 6 sleep quality indicator questions from the NCHA – II. Each variable was represented by a distinct color to identify the relationships between variables more easily (See Figure 1 and Figure 2). Six traditional demographic variables included age, gender, ethnicity (white versus non-white), year in school, Greek housing (Sorority or Fraternity housing versus any other housing), and on campus university housing (residency in residence hall or other university housing besides Greek housing versus off-campus residency of any type). Four commitment based demographic variables included hours worked per week, hours volunteered per week, athletic participation (varsity athlete versus non-varsity athlete), and enrollment status (Full time versus part time or other). Eight health behavior variables included use of tobacco, alcohol, marijuana, illicit stimulants, illicit depressants, other illicit drugs, binge drinking, and meeting cardiovascular physical activity recommendations. Finally, five health indicator variables included psychological wellbeing (diagnosis of depression

or anxiety), perceived health rating, diagnosis of a sleep disorder (insomnia or other), body mass index, and stress level. Each of these variables was hypothesized to have a direct effect on sleep quality, while several were also hypothesized to mediate the relationship of other variables to sleep quality based on the literature (Bixler, 2009; Bixler et al., 2002; Brown et al., 2006; Cappuccio et al., 2008; Dusselier et al., 2010; Goel et al., 2005; Kelly, 2003; Krishnan & Collop, 2006; National Sleep Foundation, 2005; Ohayon et al., 2004; Pilcher & Ott, 1998; Schierenbeck et al., 2008; Schoenborn & Adams, 2008; Vgontzas et al., 2008; Zhang & Wing, 2006). The hypothesized mediations were that relationship between sleep quality and:

1. year in school is mediated by age;
2. use of tobacco, alcohol, marijuana, illicit stimulants, illicit depressants, other illicit drugs, and binge drinking is mediated by gender;
3. use of tobacco, alcohol, and meeting cardiovascular physical activity recommendations is mediated by ethnicity;
4. illicit stimulants, illicit depressants, other illicit drugs and binge drinking is mediated by Greek housing;
5. meeting cardiovascular physical activity recommendations is mediated by athletic participation; and
6. body mass index is mediated by meeting cardiovascular physical activity recommendations.

These descriptive statistics and the structural equation modeling were used to examine the proposed research questions for the current study. The methods for each research question were:

Research question one. To determine the current descriptive picture of students' sleep as described by the NCHA – II, the mean or percentage were calculated for each of the sleep related items.

Research question two. To determine if survey data supported the proposed causal model for sleep quality (See Figure 1, structural model, and Figure 2, measurement model, See Appendix F for a list of variable names), or described a reduced alternate model, structural equation modeling was used to conduct a factor analysis of sleep quality variables and to simultaneously test the linear relationships between measured variables, exogenous and then endogenous (mediating). Standardized regression coefficients with alpha of greater than 0.05 were pruned from the model to create the most parsimonious and best-fit trimmed model to explain factors significantly predicting the meaningful variance in sleep quality.

Data Reporting

This original survey data were reported internally to the University Health Education Resource Office staff, and then were available by special request at the discretion of the Director of Student Health Services and the Associate Vice Provost for Student Success in the Office of the Vice Provost for Student Affairs. Results from this were reported to the University Health Education Resource Office staff for review and utilization to promote better sleep related outcomes on campus through addressing the factors contributing to sleep quality.

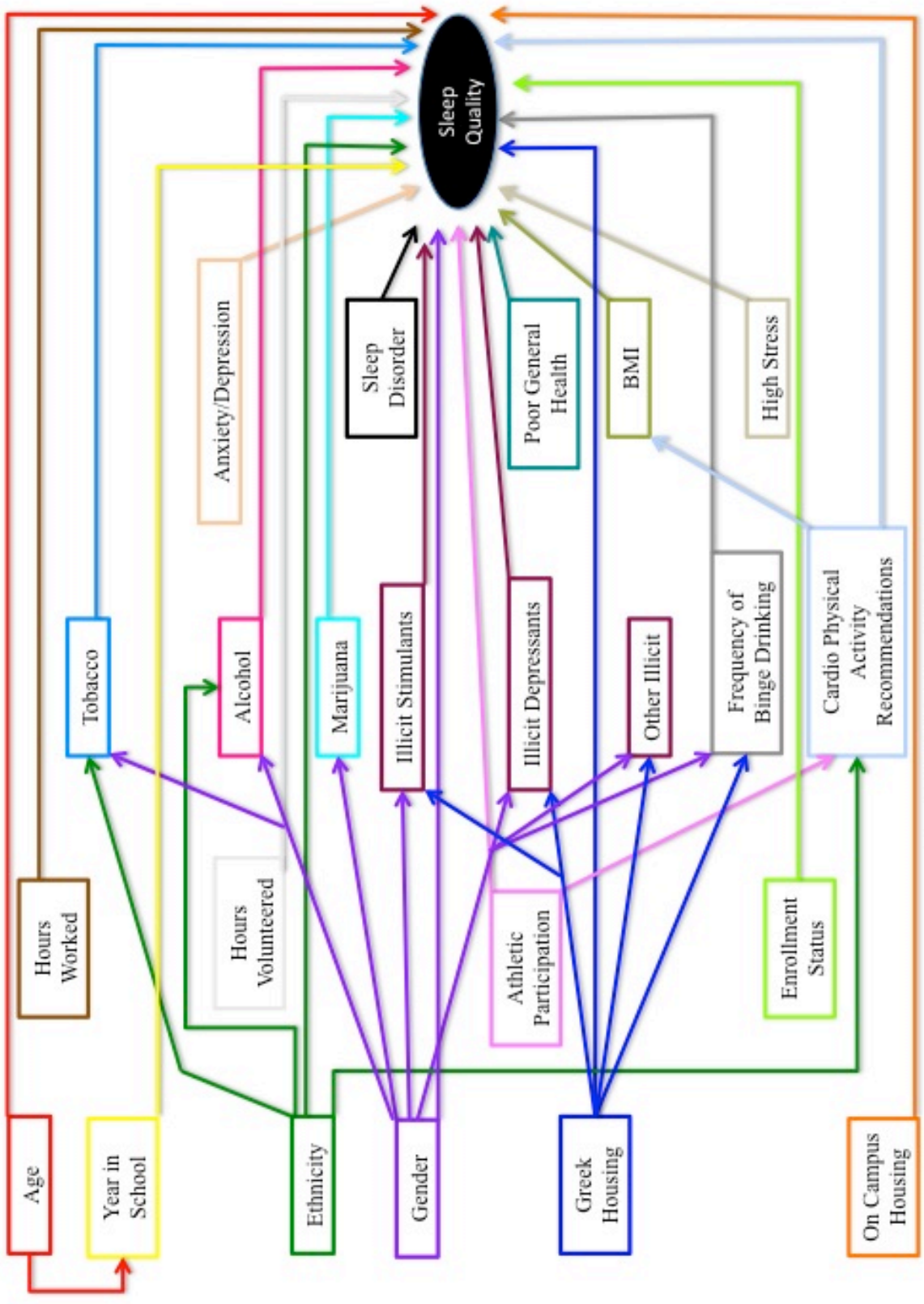

Figure 1. Proposed structural model

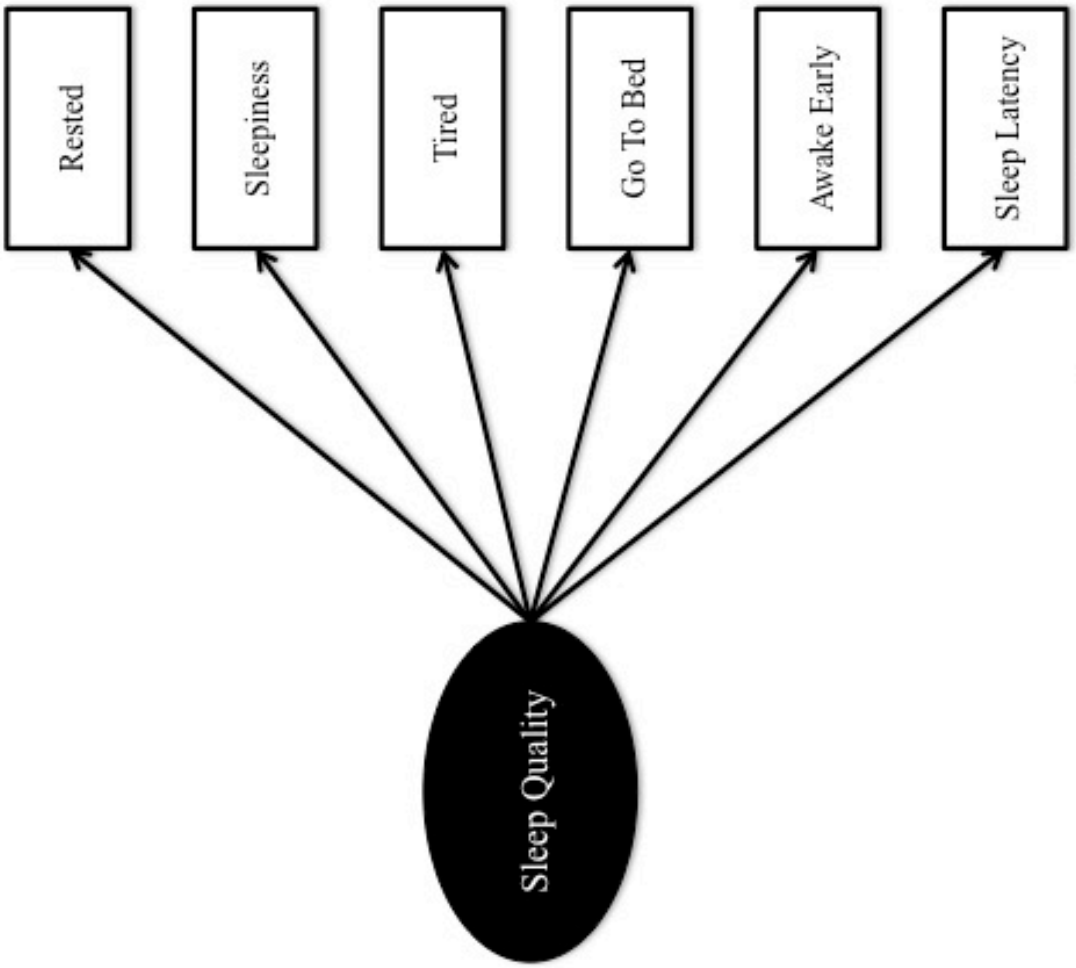

Figure 2. Proposed measurement model

Chapter IV

Results

Purpose

The purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the population as measured by the American College Health Association's National College Health Assessment-II.

Sample Demographics

The full population of respondents to the NCHA-II was reduced to identify the emerging adult population. Of the remaining participants (N = 762), 38.2% (n = 291) were male, and 61.8% (n = 471) were female. The mean age was 20.44 years, and the majority of the sample, 85.2% (n = 649), was non-Hispanic white and enrolled full time, 96.2% (n = 733). Year in school class analyses resulted in 19.3% (n = 147) as first year undergraduates, 24.7% (n = 188) were second year undergraduates, 31.6% (n = 241) were third year undergraduates, 19.3% (n = 147) were fourth year undergraduates, and 5.1% (n = 39) were 5th year undergraduates. The majority of students, 52% (n = 396), lived off campus, 24.1% (n = 184) in a campus residence hall, 11.8% (n = 90) in a fraternity or sorority, 7.2% (n = 55) in other university housing, 3.4% (n = 26) in their parents' or guardians' home, and less than 1% (n = 7) in another type of residence. Over half of students worked for pay (53.3%, n = 407), about half volunteered (46.5%, n = 354), and 9.3% (n = 71) participated in varsity athletics at the university. See Table 1 for a complete description of the demographic characteristics of the sample.

Table 1

Demographics (N = 762)

Demographic	*n*	%
Age (M = 20.44)		
18	43	5.6
19	160	21.0
20	145	23.0
21	221	29.0
22	128	16.8
23	35	4.6
Gender		
Male	291	38.2
Female	471	61.8
Ethnicity		
White, non Hispanic	649	85.2
Black, non Hispanic	41	5.4
Hispanic or Latino/a	33	4.3
Asian or Pacific Islander	39	5.1
American Indian, Alaskan Native, or Native Hawaiian	14	1.8
Biracial or Multiracial	11	1.4
Other	8	1.0
Year in School		
1st year undergraduate	147	19.3
2nd year undergraduate	188	24.7
3rd year undergraduate	241	31.6
4th year undergraduate	147	19.3
5th year undergraduate	39	5.1
Current Residence		
Campus residence hall	184	24.1
Fraternity or sorority house	90	11.8
Other college/university housing	55	7.2
Parent/guardian's home	26	3.4
Other off-campus housing	396	52.0
Other	7	0.9
Enrollment Status		
Full-Time	733	96.2
Part-Time/Other	26	3.4
Hours Worked Per Week		
0 hours	351	46.1
1-9 hours	97	12.7
10-19 hours	177	23.2
20-29 hours	94	12.3
30-39 hours	29	3.8
40 hours	1	0.1
More than 40 hours	9	1.2

Table 1 Continued

Demographics (N = 762)

Demographic	*n*	%
Hours Volunteered Per Week		
0 hours	403	52.9
1-9 hours	324	42.5
10-19 hours	21	2.8
20-29 hours	4	0.5
30-39 hours	2	0.3
40 hours	1	0.1
More than 40 hours	2	0.3
Athletic Participation		
Varsity Athlete	71	9.3
Non Varsity Athlete	672	88.2

Descriptive statistics for each set of variables in the proposed model (health behaviors, health status indicators, sleep related demographics, and sleep quality indicators) were also analyzed. Health behaviors are presented in Table 2, health status indicators in Table 3, sleep related demographics in Table 4, and sleep quality indicators in Table 5.

Table 2

Health Behaviors (N = 762)

Health Behavior	*n*	%
Tobacco used in past 30 days		
No	544	71.4
Yes	198	26.0
Alcohol used in past 30 days		
No	154	20.2
Yes	593	77.8
Marijuana used in past 30 days		
No	576	75.6
Yes	174	22.8
Illicit Stimulants used in past 30 days		
No	717	94.1
Yes	36	4.7
Illicit Depressants used in past 30 days		
No	743	97.5
Yes	13	1.7
Other Illicit drugs used in past 30 days		
No	730	95.8
Yes	23	3.0

Table 2 Continued

Health Behaviors (N = 762)

Health Behavior	*n*	%
Number of times Binge Drinking in past 2 weeks		
0	330	43.3
1	132	17.3
2	106	13.9
3	61	8.0
4	47	6.2
5	32	4.2
6	23	3.0
7	10	1.3
8	4	0.5
9	4	0.5
10 or more	5	0.7
Cardiovascular Physical Activity Recommendations		
Not Met	298	39.1
Met	460	60.4

Table 3

*Health Status Indicators (*N = *762)*

Health Status Indicator	*n*	%
General Health		
Excellent	120	15.7
Very Good	324	42.5
Good	184	24.1
Fair	36	4.7
Poor	5	0.7
Don't Know	93	12.2
Stress		
No Stress	18	2.4
Less than average stress	70	9.2
Average Stress	289	37.9
More than average stress	294	38.6
Tremendous stress	87	11.4
Psychological Wellbeing		
Diagnosed with Anxiety in last 12 months	71	9.3
Diagnosed with Depression in last 12 months	65	8.5
Body Mass Index (BMI) (M = 23.4)		
Underweight	42	5.5
Desired weight	510	66.9
Overweight	138	18.1
Obese	48	6.2

Research Question One

To determine the current descriptive picture of students' sleep as described by the NCHA – II, the mean or percentage were calculated for each of the sleep related items. Results are presented in Table 4 and Table 5, and summarized as follows:

a. 2.6 % of students had been diagnosed or treated by a professional for Insomnia or other sleep disorder in the past 12 months.
b. 20.5% of students found sleep difficulties to be traumatic or very difficult to handle within the last 12 months.
c. 14.3% of students reported sleep difficulties interrupted their academic performance within the last 12 months.
d. 41.2% of students reported having received information on sleep difficulties from the university.
e. 45.4% of students reported being interested in receiving information on sleep difficulties from the university.
f. On average, students felt they got enough sleep 3.99 days per week so that they felt rested when they woke up in the morning.
g. On average, students felt they awakened too early in the morning and couldn't get back to sleep 2.06 days per week.
h. On average, students felt they were tired, dragged out, or sleepy during the day 4.38 days per week.
i. On average, students reported going to bed because they just could not stay awake any longer 3.04 days per week.
j. On average, students had an extremely hard time falling asleep 2.43 days per week.

k. On average, on a scale from 1, no problem at all, to 5, a very big problem, as to how much of a problem students had with sleepiness (feeling sleep, struggling to stay awake) during their daytime activities, the mean score was 2.63.

Table 4

*Sleep Related Demographics (*N = *762)*

Sleep Related Demographic	*n*	%
Sleep Diagnosis in past 12 months		
Insomnia and/or Other Sleep Disorder	20	2.6
Received Information from University on Sleep		
No	432	56.7
Yes	314	41.2
Interested in Receiving information on Sleep		
No	368	48.3
Yes	346	45.4
Sleep Difficulties been difficult to handle in past 12 months		
No	595	78.1
Yes	156	20.5
Sleep Difficulties affected academic performance in past 12 Months		
No	627	82.3
Yes	109	14.3

Table 5

*Sleep Quality Indicators (*N = *762)*

Sleep Quality Indicators	n	%
Rested (M = 3.99)		
0	82	10.8
1	99	13
2	132	17.3
3	153	20.1
4	115	15.1
5	101	13.3
6	50	6.6
7	25	3.3

Table 5 Continued

*Sleep Quality Indicators (*N = *762)*

Sleep Quality Indicators	n	%
Awake Early (M = 2.06)		
0	388	50.9
1	157	20.6
2	91	11.9
3	61	8
4	20	2.6
5	17	2.2
6	10	1.3
7	7	0.9
Tired (M = 4.38)		
0	52	6.8
1	92	12.1
2	156	20.5
3	121	15.9
4	101	13.3
5	98	12.9
6	52	6.8
7	82	10.8
Go To Bed (M = 3.04)		
0	221	29
1	150	19.7
2	123	16.1
3	85	11.2
4	82	10.8
5	34	4.5
6	25	3.3
7	34	4.5
Sleep Latency (M = 2.43)		
0	327	42.9
1	170	22.3
2	83	10.9
3	73	9.6
4	38	5
5	26	3.4
6	19	2.5
7	18	2.4
Sleepiness (M = 2.63)		
No problem at all, or 1	65	8.5
A little problem, or 2	359	47.1
More than a little problem, or 3	182	23.9
A big problem, or 4	97	12.7
A very big problem, or 5	56	7.3

Research Question Two

To determine if survey data supported the proposed causal model for sleep quality, or described a reduced alternate model, structural equation modeling (SEM) was used to conduct a factor analysis of sleep quality variables and to simultaneously test the linear relationships between measured variables, exogenous and then endogenous (mediating) through a series of steps to arrive at a trimmed best-fit model using maximum likelihood (ML) estimation methodology.

Step one. A confirmatory factor analysis (CFA) was conducted to test the proposed measurement model of five observed sleep quality indicator variables constructing a single sleep quality latent construct. The latent construct variance was set to 1.0, which established a standard metric with a mean of 0 and SD of 1 for interpretation. The CFA produced results indicating that two of the observed variables, (awakened too early in the morning and couldn't get back to sleep, and had an extremely hard time falling asleep in the past seven days) were interacting differently than the other four, and resulting in unacceptable fit indexes (Chi-square = 150.16, $df = 9$, CFI = .88, TLI = .80, RMSEA = .14, SRMR = .074.) with the two variables explaining less of the variance in the latent sleep quality construct (R^2 = .05 and .11 respectively, compared to R^2 = .18 to .84 among other sleep quality indicator variables). General rules for acceptable fit of data were utilized, comparative fit index (CFI) $\geq$ 0.95, Tucker-Lewis index $\geq$ 0.95, root mean square error of approximation (RMSEA) <0.06-0.08 with confidence interval, and standardized root mean residual (SRMR) $\leq$ 0.08 for acceptance (Schreiber, 2008). Based on these results it was hypothesized that the two variables may create a different latent construct, sleep quality insomnia, describing difficulties students have in falling asleep, that is correlated

with the latent construct measured by the other four variables, sleep quality somnolence, measuring how sleepy students are across the day.

Step two. A confirmatory factor analysis (CFA) was conducted to test the hypothesis that there may be an additional correlated latent construct, resulting in two sleep quality indicators measuring difficulty falling asleep correlated with four sleep quality indicators measuring somnolence across the day. The factor loadings of the two variables constructing the new latent construct were set to be equal to allow for local identification of the model. Results of the CFA, presented in Table 6, confirmed the additional latent variable with more acceptable fit indexes (Chi-square = 35.46, *df* = 9, CFI = .98, TLI = .96, RMSEA = .06, SRMR = .04) and improved R^2 values (R^2 = .51 and .38 respectively). This two latent construct measurement model was retained for the larger structural equation model, as it better represented the relationships among the observed variables, showing the distinction between two related variables measuring difficulty falling asleep, labeled as sleep quality insomnia, and tiredness throughout the day, labeled as sleep quality somnolence.

Step three. A structural equation modeling (SEM) analysis was used to test the exogenous paths of the proposed structural model in conjunction with the measurement model defined through the CFA (see step 2). The mediating paths were reserved for future analysis. Results of the SEM identified overall good fit of the proposed model and are presented in table 6 (Chi-square = 164.04, *df* = 101, CFI = .99, TLI = .94, RMSEA = .03 with a 90% confidence interval of .02-.04, SRMR = .02).

Step four. Each standardized regression coefficient with an insignificant alpha, using the cutoff of p = .05, was pruned one by one to identify the most parsimonious model that explained the most meaningful variance while maintaining acceptable fit indexes. A chi-square analysis

was conducted between each new model and both the original proposed model and the previous reduced model with one less path pruned. The removal of insignificant regression paths resulted in no significant differences between the proposed and reduced models as measured by a chi-square analysis (See Appendix G for a list of pruned paths). It should be noted that as paths were pruned the use of other illicit drugs became insignificant, when it was previously significant in the proposed model when regressed with sleep quality insomnia. Removal of the path did not result in a significant difference between models, and maintaining the path did not improve model fit, therefore it was pruned. Also, as paths were pruned the last path to be pruned, psychological wellbeing as measured by diagnosis of anxiety and/or depression, became significant when it was previously insignificant in the proposed model when regressed with sleep quality insomnia. Removal of the path resulted in a statistically significant chi-square analysis between the model without it pruned, and was therefore maintained as it explained more meaningful variance in the model. The results of the SEM of the final trimmed model identified overall good fit and are presented in Table 6 (Chi-square = 207.43, *df* = 139, CFI = .99, TLI = .96, RMSEA = .025 with a 90% confidence interval of .018-.032, SRMR = .021). The more parsimonious final trimmed model was not significantly different than the proposed model ($\Delta\chi^2$ [38 *df*] = 43.39, *p* = .25).

Table 6

Comparison of Fit Indexes for the One Latent Construct CFA, Two Latent Construct CFA, Hypothesized SEM and Trimmed SEM

Model	*χ2*	*df*	*p*	CFI	TLI	RMSEA	90% CI RMSEA	SRMR
One Latent Construct CFA	150.16	9	0.001***	0.88	0.81	0.14	.12-.16	0.07
Two Latent Construct CFA	35.46	9	0.001***	0.98	0.96	0.06	.04-.08	0.04
Proposed SEM	164.04	101	0.001***	0.99	0.94	0.03	.02-.04	0.02
Trimmed SEM	207.44	139	0.001***	0.99	0.96	0.02	.02-.03	0.02

*$p < .05$, **$p < .01$, ***$p < .001$

Step five. Hypothesized mediating paths were added to the trimmed model, which was again tested. Only one variable that was hypothesized to be mediated by others remained in the model, binge drinking. Addition of mediating effects produced a significant chi square difference test between the trimmed model and model with mediation included, while also reducing the acceptability of fit indexes, and therefore were not maintained.

Trimmed model. The trimmed model is displayed in Figure 3. Parameter analysis revealed that full information maximum likelihood handling of missing data never exceeded .19, and therefore recovered 89% of missing data. For latent constructs the model overall explained 17% of the variance in sleep quality somnolence, and 14% of the variance in sleep quality insomnia. The exogenous variables in the model explained a range of variance in the observed sleep quality indicator variables from 19% to 81%. All R^2 values are presented in Table 7. The correlation between the two latent constructs, sleep quality somnolence and sleep quality insomnia, was significant ($r = 0.381$, $p = .001$). Correlations for observed predictor structural model variables are presented in Appendix H.

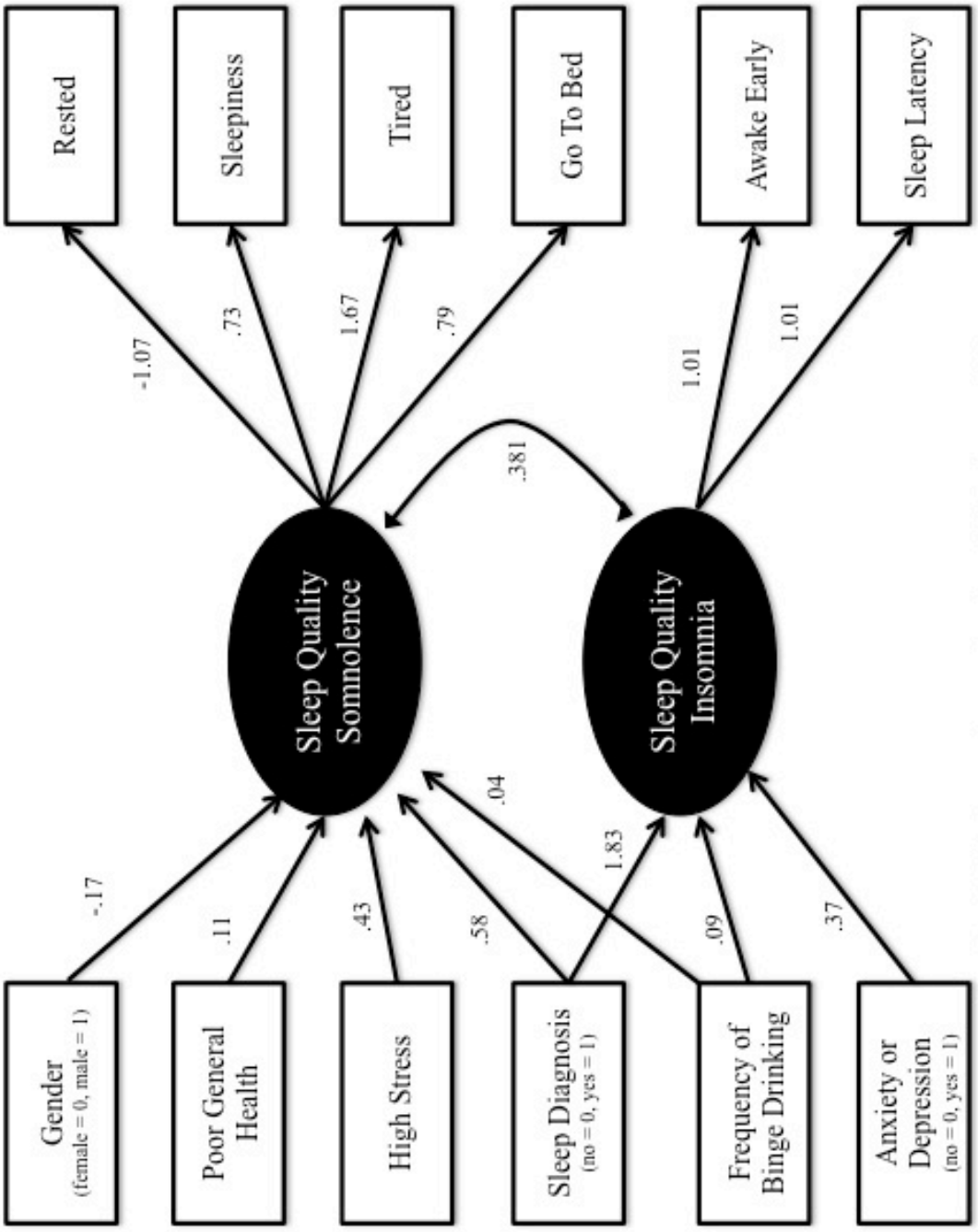

Figure 3. Trimmed model of sleep quality. Depicted model includes correlations among all variables utilized to produce results, including pruned variables not depicted.

Table 7

R^2 and Residual Disturbance Error for Endogenous Variables in Trimmed Model

Variable	R^2	Residual
Rested	0.40	0.60
Sleepiness	0.60	0.40
Tired	0.81	0.19
Go To Bed	0.19	0.81
Awake Early	0.51	0.49
Sleep Latency	0.38	0.62
Sleep Quality Somnolence	0.17	0.83
Sleep Quality Insomnia	0.14	0.86

The parameter estimate results for the latent constructs are presented in Table 8. For sleep quality somnolence, increases in sleepiness during the day, number of days experiencing tiredness during the day, and going to bed because one could not stay awake any longer resulted in significant mean increases in overall sleep quality somnolence (β = .73, 1.67, and .79 respectively). Getting enough sleep to feel rested on more days per week resulted in a 1.07 mean decrease in overall sleep quality somnolence. For sleep quality insomnia, both awakening early and not being able to get back to sleep and having a hard time falling asleep resulted in a 1.01 mean increase in sleep quality insomnia.

Table 8

Regression Coefficient Estimates, Standard Error, Z-value, and Significance Value for Latent Variable Regressions

Parameter	*Estimate*	Std. Error	*z-value*	p value
Sleep Quality Somnolence				
Rested	-1.07	0.06	-18.22	0.001***
Sleepiness	0.73	0.03	23.33	0.001***
Tired	1.67	0.06	26.70	0.001***
Go To Bed	0.79	0.07	11.90	0.001***
Sleep Quality Insomnia				
Awake Early	1.01	0.05	20.35	0.001***
Sleep Latency	1.01	0.05	20.35	0.001***

*$p < .05$, **$p < .01$, ***$p < .001$

The parameter estimate results for variables in the structural model are presented in Table 9. For sleep quality somnolence five predictor variables, gender, sleep diagnosis, poor general health, high stress, and frequency of binge drinking, were significant and included in the final SEM. Being male results in a significantly lower mean somnolence of .17. Those with a sleep diagnosis of insomnia and/or another sleep disorder have a significantly higher mean somnolence of .58. As self-reported general health worsens the somnolence mean significantly increases by .11, and as self reported stress increases the somnolence mean significantly increases by .43. Finally, as the number of times binge drinking increases, mean somnolence increases significantly by .04.

For sleep quality insomnia three predictor variables, sleep diagnosis, frequency of binge drinking, and anxiety or depression diagnosis, were significant and included in the final SEM. Those students with a sleep diagnosis of insomnia and/or another sleep disorder have a higher mean latency of 1.83. As the number of times binge drinking increases mean latency increases .09. Those with a psychological wellness diagnosis of anxiety or depression have a significant mean higher latency, .37.

Table 9

Regression Coefficient Estimates, Standard Error, Z-value, and Significance Value for Exogenous Predictor Variable Regressions

Parameter	*Estimate*	Std. Error	*z-value*	p value
Sleep Quality Somnolence				
Gender	-0.17	0.08	-2.04	0.042*
Sleep Diagnosis	0.58	0.25	2.30	0.022*
Poor General Health	0.11	0.05	2.16	0.031*
High Stress	0.43	0.05	8.98	0.001***
Frequency of Binge Drinking	0.04	0.02	2.00	0.045*
Sleep Quality Insomnia				
Sleep Diagnosis	1.83	0.34	5.44	0.001***
Frequency of Binge Drinking	0.09	0.02	3.80	0.001***
Anxiety or Depression Diagnosis	0.37	0.16	2.38	0.017*

*$p < .05$, **$p < .01$, ***$p < .001$

Chapter V

Discussion

Purpose

The purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the population as measured by the American College Health Association's National College Health Assessment-II.

Research Question One

The current status of the emerging adult sample population's sleep seems to be mediocre at best. While it is unrealistic to assume the possibility of no negative sleep experiences or outcomes it surely is realistic that they may be minimized. Over one fifth (20.5%) of the sample found sleep difficulties to be traumatic or very difficult to handle within the last 12 months. This mirrors the national data of the percent of the American population that experiences chronic wakefulness or sleep disorders (Colton & Altevogt, 2006). On average, students expressed having from a little problem to more than a little problem with sleepiness (feeling sleep, struggling to stay awake) during their daytime activities. While in terms of sleepiness as a measure of sleep quality the majority of students felt tired, dragged out, or sleepy during the day most days of the week and felt that they got enough sleep to feel rested in the morning on less than four days. This experience was reflected in the evening, with students feeling the need to go to bed because they were so tired they just couldn't say up any longer on more than three days per week. However, it was not just being sleepy that seemed to be a sleep quality indicator for the population, but also the ability to fall asleep, or latency related sleep quality. Many also

reported having an extremely hard time falling asleep multiple days per week, or waking too early and not being able to return to sleep.

These experiences may be influencing students ability to function in school, as identified by the fact that 14.3% of the sample reported that sleep difficulties interrupted their academic performance in the last year. A great number of other situations and experiences, from social situations to general stress levels and health impacts theoretically may be a result. Furthermore, this high number of individuals experiencing difficulties is disturbing, as it has been found that across the decades college students are receiving less sleep per night (Hicks et al., 2001; Hicks et al., 1989; Hicks & Pellegrini, 1991) and as individuals age sleep problems increase (Ohayon et al., 2004). The current trend seems to suggest a similar phenomenon in sleep as there is with obesity in our nation, an increase in problems for each new generation, which must be addressed and reversed. This does not seem to be occurring for the emerging adult population at the current point in time. For example, in the current sample only 2.6 % of students had been diagnosed or treated by a professional for Insomnia or other sleep disorder in the past 12 months.

This may be interpreted in both a positive and negative light. Negatively, this suggested that while students experienced problems they were not seeking solutions for the problem. This may be due to the popular norm that everyone has problems with sleep, that they "can sleep when they die", and the reflection of a demanding society. While professionals would like to make sleep less of a passive health behavior, and increase the attempts to improve sleep quality and quantity, the low percentage of those diagnosed with a sleep disorder may also be addressed in a positive light. While a large portion of the population may have a diagnosable sleep disorder, we do not want diagnosis to become a habit or a trend when it is unnecessary. This would result in more individual being prescribed prescription sleep medications, which often

perpetuate sleep problems due to high levels of tolerance and dependency characteristics and are already among the highest used and abused drugs in the United States (Lessenger & Feinberg, 2008).

Ultimately, the goal should be to address this high level of poor sleep experiences in the emerging adult population through education on the best practices to address sleep quality and quantity and to make the norm for sleep to be an active health behavior. It is possible that this is beginning to occur and that students are interested in receiving information on sleep, as 41.2% had received information from the university and 45.4% would like to receive information. A goal for campuses would be to increase these numbers through sleep related health education and promotion efforts to address factors contributing to the poor sleep. The factors contributing to poor sleep, or reasons for not sleeping well, may include traditional poor sleep hygiene behaviors as well as factors found to be significant predictors in research question two. Therefore, the health education and promotion efforts should address traditional sleep hygiene factors described previously and other health behaviors, health indicators, and demographics.

Research Question Two

The process of conducting structural equation modeling identified a trimmed model of sleep quality with two sleep quality latent constructs identified by six sleep quality indicator variables and influenced by six health variables (one of a demographic type, four health indicator, and one health behavior) that had good fit.

Measurement model. In the exploratory and confirmatory process to determine if the sleep items from the NCHA-II were indeed measuring a common sleep quality construct it was determined that the items were measuring two related sleep quality constructs. First, the amount of somnolence experienced by students across the day, and second, the difficulty students have in

falling asleep, also termed sleep latency. It is easy to conceptualize the difference between the two constructs when observing how each item is constructed, as they clearly address two different aspects of sleep quality. This distinction benefits both the current study and the NCHA-II survey itself, for sleep quality is a subjective experience that varies from individual to individual (Harvey et al., 2008). Therefore, it is better to measure it through multiple avenues to better represent the differing experiences of all individuals (Harvey et al., 2008), in this case the experience of somnolence and the experience of having a difficult time getting to sleep. The fact that the results suggested the measurement of sleep quality in more than one way supports the continued use of the items on the NCHA-II and the use of them to identify a model of sleep quality in the population.

Structural model. In the exploratory process to determine if the hypothesized demographic, health behavior, and health status indicator variables predicted sleep quality it was determined that six variables significantly predicted one or both of the sleep quality constructs.

Sleep quality somnolence. Sleep quality somnolence was predicted by five variables, gender, sleep diagnosis, poor general health, high stress, and frequency of binge drinking.

Gender. Results showed that being male decreases somnolence, and therefore identifies females as the gender with greater poor sleep quality in terms of somnolence. This finding is supported by the known phenomenon of hormonal and physical changes across the lifespan leading to an increase in risk of sleep problems for women (Krishnan & Collop, 2006), and the changes resulting in women having more sleep complaints than men (Bixler et al., 2002; Zhang & Wing, 2006). However, it has been found prior that even with the problems and complaints women tend to have better sleep quality than men (Goel et al., 2005). The discrepancy may have been due to the subjective nature of sleep quality and the many different methods of assessing it.

In the current study, sleep quality is identified by complaints related to sleep and sleepiness or somnolence, therefore meeting the subjective identification of sleep quality for women better than males. It is possible that the items used to assess sleep and construct sleep quality in the NCHA-II and the current study are better suited to the female gender in terms of measuring sleep quality.

Sleep diagnosis. Results showed that having a diagnosis of insomnia and/or another sleep disorder results in poorer sleep quality in terms of somnolence. Diagnostic measures of sleep disorders include a range of questions and the result is a list of over 100 sleep disorders falling into a range of four categories: (1) problems falling asleep and staying awake (insomnia), (2) problems staying awake (excessive daytime sleepiness), (3) problems sticking to a regular sleep schedule (sleep rhythm problems), (4) and unusual behaviors during sleep (sleep disruptive behaviors) (Merrill, 2011). These categories are reflective of many sleep quality indicators, and the second category directly reflects the latent sleep quality construct, somnolence, and the items from the NCHA-II which identify it, supporting the results.

Poor General health. Results showed that reporting poorer general health results in poorer sleep quality in terms of somnolence. This finding is supported by a multitude of research indicating that poor sleep quality is related to a spectrum of health problems. For example, Strine and Chapman (2005) studied the effects of frequent sleep insufficiency on health-related quality of life and found that sleep insufficiency resulted in individuals reporting significantly more physical distress, mental distress, depressive symptoms, activity limitations, pain, anxiety, and general poor health. The uniqueness of the finding in the current study is that general health itself may be comprised of a variety of issues, such as chronic disease, a sense of wellness, health behaviors, and is likely related to every one of the health behavior and health

indicator variables in the proposed model. Hence, the significant finding of general health's relationship to sleep quality somnolence may indicate a greater amount of information.

High Stress. Results showed that reporting greater levels of stress experienced results in poorer sleep quality in terms of somnolence. Stress has long been identified as a positive correlate of poor sleep in the general population (Bixler, 2009; Vgontzas et al., 2008), and unsurprisingly so in the emerging adult population (Verlander et al., 1999), supporting the current study findings. For the emerging adult population there are unique stressors that should be addressed, such as the academic demands, social demands, and the environmental stressors of the university populace setting.

Frequency of Binge drinking. Results showed that reporting binge drinking a greater number of times results in poorer sleep quality in terms of somnolence. This result is not unique to this study. Alcohol consumption has been found to significantly predict the duration of sleep, timing of sleep, differences between weekday and weekend nighttime sleep hours, and differences between weekday and weekend bedtime hours in the college student population (Singleton & Wolfson, 2009). Excessive alcohol use has also been found to be more prevalent among those who sleep less than six hours per night than among those sleeping seven to eight hours or more per night (Schoenborn & Adams, 2008). It is therefore not surprising that binge drinking, an activity strongly associated with the college atmosphere, seems to have a negative effect on sleep quality. This behavior is one that is unlikely to be stopped entirely, but education can easily address and likely lower the prevalence as a means to improve sleep quality.

Sleep quality insomnia. Sleep quality insomnia was predicted by three variables, sleep diagnosis, frequency of binge drinking, and anxiety or depression diagnosis.

Sleep diagnosis. Results showed that having a diagnosis of insomnia and/or another sleep disorder results in poorer sleep quality in terms of latency. Diagnostic measures of sleep disorders include a range of questions and the result is a list of over 100 sleep disorders falling into a range of four categories: (1) problems falling asleep and staying awake (insomnia), (2) problems staying awake (excessive daytime sleepiness), (3) problems sticking to a regular sleep schedule (sleep rhythm problems), (4) and unusual behaviors during sleep (sleep disruptive behaviors) (Merrill, 2011). These categories are reflective of many sleep quality indicators, and the first category directly reflects the latent sleep quality construct, latency, and the items from the NCHA-II which identify it, supporting the results.

Frequency of binge drinking. Results showed that reporting binge drinking a greater number of times results in poorer sleep quality in terms of latency. As discussed previously, this result is not unique to this study, and binge drinking is a behavior that can be addressed through prevention on campuses, with the possible subsequent outcome of improved sleep quality.

Anxiety or depression diagnosis. Results showed that having a diagnosis of anxiety and/or depression results in poorer sleep quality in terms of latency. Other research supports this finding. Pichler et al. (1997) and Moo-Estrella et al. (2005) both found that sleep quality was significantly related to depression and depressive symptoms. Worry, similar to anxiety, has also been associated with decreased sleep length, as well as stress, resulting in a significant effect on sleep latency (Kelly, 2003; Verlander et al., 1999). Depression and anxiety may work to impact sleep latency through characteristics associated with the conditions that result in the mind having a difficult time "shutting off" as well as physiological phenomenon, such as imbalances in dopamine, serotonin, and norepinephrine among other neurotransmitters and hormones.

Pruned exogenous variables. The exploratory structural equation modeling process resulted in the pruning of 17 demographic, health behavior, and health indicator variables from the model, as well all hypothesized mediation paths. A list of the pruned variables is presented in Appendix G. There are several possible explanations for the nonsignificant paths between these variables and the sleep quality constructs. First, there may not be enough variance in the variables due to the homogeneity of the emerging adult college student population. For example, the age range was only 5 years and the majority of students tend to have similar health and health behaviors. Second, the majority of correlations among variables (Appendix H) were quite small. This presents the idea that while it is widely known in the field of health that many health behaviors and health indicators are correlated, and presumably many of them with sleep as data seems to suggest, the current study did not reflect such. Furthermore, it is possible that just as sleep quality is a subjective phenomenon, the influences upon it may vary from individual to individual, with only a few being consistent across the population. Therefore, while the six variables identified as significant in the current study may explain the most meaningful amount of variance in sleep quality for the population as a whole, it should not be disregarded that each individual has unique factors that may affect his or her sleep quality differently than the student sitting next to them in class. This may be conceptualized as well by the fact that many of these likely contribute to perceived poor general health, which was found to impact sleep quality, and may capture many of the nonsignificant health behaviors and health status indicators..

Full trimmed SEM. The full trimmed model provides superior fit while explaining meaningful variance compared to the proposed model and may be used as a tool for identifying best practices for health education and promotion surrounding sleep in the emerging adult population on campuses. In total, it may be utilized to promote better sleep related outcomes to

reduce health disparities across the lifespan by addressing the six factors contributing to sleep quality according to the current model identified in the study. Promotion should address stress through stress management, the reduction of binge drinking, and ways to promote general health which is addressed through a variety of health and wellness promotion focuses. Furthermore, a consideration should be made to target specific populations through gender specific sleep programming and education, and by addressing the needs of those diagnosed with sleep disorders as well as anxiety and depression.

Contributions to the Field

The findings of this study indicate that college students, as a part of the emerging adult population, are experiencing poor sleep at rates similar to adults. This finding is important because it identifies that sleep should be addressed in the population early, that methods for doing so should be addressed, and adds to the limited research existing prior on emerging adult sleep. Based upon the review of literature, nothing was found that suggested there has been any attempt to create a model of sleep quality in the emerging adult population other than the current study that may be functionally utilized by health educators to inform sleep promotion and education efforts.

Chapter VI

Summary, Conclusions, and Recommendations

Summary

Sleep has been long studied in the adult and adolescent populations. This is rightfully so, as the status of sleep in the populations can be defined as one that is poor, behaviors towards improving sleep are either passive or cause more problems through dependence on sleep aids, and the impact of insufficient sleep on health and wellbeing is overwhelming. A call for a better understanding of the same phenomenon in the emerging adult population has been made. Efforts to do so may have the ability to improve sleep quality and quantity during an important transitional time in an individual's life, and by establishing positive sleep behaviors and outcomes early in life a pattern may be extended throughout the life course to reduce health disparities. The research thus far on the emerging adult population is concentrated on those enrolled in higher education. Findings have shown a decrease in students' sleep each decade, poor sleep quality, and determinants such as alcohol use, stress, and responsibilities and participation in multiple activities. Sleep in the emerging adult population may be addressed through programing such as sleep hygiene education, but the demographics, health behaviors, and health indicators to be focused on in addition to community and environmental change typical of sleep hygiene education are unclear.

This study was designed to confirm the poor status of students sleep quality and identify possible areas of focus for sleep related health education and promotion. Specifically, the purpose of this study was to describe the current state of emerging adults' sleep patterns and develop a model of demographic, behavioral, and health status predictors of sleep quality in the

population as measured by the American College Health Association's National College Health Assessment-II.

The study was carried out using descriptive statistic analyses and structural equation modeling. The exploratory and confirmatory process included analyzing the construction of latent sleep quality variables measured by the sleep quality related items on the NCHA-II and the predictive significance of demographic, health behavior, and health status indicators on sleep quality. Descriptives of sleep quality and related factors were identified, and a final trimmed model with good fit was attained. Results lead to the following conclusions and recommendations.

Conclusions

There were eight conclusions made based on the results of the study, which were:

1. The status of sleep quality in the emerging adult population is mediocre to poor, and similar to the general population.
2. Poor sleep quality is impacting students' daytime functioning and academic performance.
3. Emerging adults are interested in receipt of information on sleep, but professionals are not meeting the desire or need.
4. A usable model of sleep quality in the population was derived from the data, which may be used in sleep education and promotion to address factors contributing to sleep quality.
5. Education should be provided on the importance of sleep to increase student's intent to engage in an active role in improving their sleep quality. Including the negative health and academic outcomes associated with poor sleep quality and quantity.

6. Sleep promotion programming should be designed, both passive and active, to increase individual intentions to seek sufficient sleep and to create sleep conducive environments and communities.
7. More efforts should be focused on stress reduction, general wellness, and reduction of binge drinking to improve sleep of students on campus.
8. Sleep education and promotion methods and programs should be designed to target the female student body population, students with already diagnosed sleep conditions, and those with anxiety and depression.

Recommendations

Based upon the findings from this study, the following recommendations for future studies were made:

1. Replicate the current study using data from institutions of varying types, sizes, and geographical locations employing the NCHA-II on campus.
2. Replicate the current study using the national NCHA-II data.
3. Extend definitions of observed health behavior variables to provide a greater level of information on each type of behavior. For example, utilize a continuous scale of the number of times using alcohol in the past 30 days.
4. Examine the inclusion of chronic conditions as a predictor of sleep quality in the model.
5. Examine the relationships between sleep quality and each non-significant observed variable individually and through multiple styles of questionnaires and measurement.
6. Examine sleep quality longitudinally across the academic year to determine opportune times for sleep health education and promotion.

7. Test model components through interventions aimed at female students, individuals with depression and anxiety, reduction of binge drinking, stress reduction, and improvement of general wellbeing to analyze the change in sleep quality as a result of stress reduction, reduced binge drinking, and improvement of general wellbeing.

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Appendix A

American College Health Association

1362 Mellon Road, Suite 180
Hanover, MD 21076
Tel: (410) 859-1500
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www.acha.org

April 2, 2013

Chandra Jennings, MSE, CHES
Graduate Teaching Assistant
University of Kansas
Department of Health, Sport, and Exercise Sciences
Robinson Building, Office 308-E
1301 Sunnyside Ave.
Lawrence, KS 66045

Dear Chandra,

You have permission to include a copy of the American College Health Association – National College Health Assessment survey instrument as an appendix in your doctoral dissertation entitled "Developing a Model of the Demographic, Health Behavior, and Health Indicator Predictors of Sleep Quality in Emerging Adults at a Large Midwestern University."

Best of luck with your studies.

Sincerely,

Mary Hoban, PhD, CHES
Director, ACHA-NCHA Program Office

Enclosure: ACHA-NCHA Data Use Guidelines and Agreement

ACHA NCHA
American College Health Association National College Health Assessment

ACHA NCHA II

American College Health Association National College Health Assessment

Instructions:

The following questions ask about various aspects of your health.

To answer the questions, fill in the oval that corresponds to your response.

Select only one response unless instructed otherwise.

Use a No. 2 pencil or blue or black ink pen only. Do not use pens with ink that soaks through the paper. CORRECT: ● INCORRECT: ✓ X — •

This survey is completely voluntary. You may choose not to participate or not to answer any specific question. You may skip any question you are not comfortable in answering.

Please make no marks of any kind on the survey which could identify you individually.

Composite data will then be shared with your campus for use in health promotion activities.

Thank you for taking the time and thought to complete this survey. We appreciate your participation!

American College Health Association

National College Health Assessment

PAGE ONE

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

Health, Health Education and Safety

1. **How would you describe your general health?**
   ○ Excellent ○ Very good ○ Good ○ Fair ○ Poor ○ Don't know

(Please mark the appropriate column for each question to the right)	2. Have you received information on the following topics from your college or university?		3. Are you interested in receiving information on the following topics from your college or university?	
	No	Yes	No	Yes
Alcohol and other drug use	○	○	○	○
Cold/Flu/Sore throat	○	○	○	○
Depression/Anxiety	○	○	○	○
Eating disorders	○	○	○	○
Grief and loss	○	○	○	○
How to help others in distress	○	○	○	○
Injury prevention	○	○	○	○
Nutrition	○	○	○	○
Physical activity	○	○	○	○
Pregnancy prevention	○	○	○	○
Problem use of internet/computer games	○	○	○	○
Relationship difficulties	○	○	○	○
Sexual assault/Relationship violence prevention	○	○	○	○
Sexually transmitted disease/infection (STD/I) prevention	○	○	○	○
Sleep difficulties	○	○	○	○
Stress reduction	○	○	○	○
Suicide prevention	○	○	○	○
Tobacco use	○	○	○	○
Violence prevention	○	○	○	○

4. **Within the last 12 months, how often did you:**
   (Please mark the appropriate column for each row)

	Always	Most of the time	Sometimes	Rarely	Never	N/A, did not do this activity within the last 12 months
Wear a seatbelt when you rode in a car?	○	○	○	○	○	○
Wear a helmet when you rode a bicycle?	○	○	○	○	○	○
Wear a helmet when you rode a motorcycle?	○	○	○	○	○	○
Wear a helmet when you were inline skating?	○	○	○	○	○	○

5. **Within the last 12 months:**
   (Please mark the appropriate column for each row)

	Yes	No
Were you in a physical fight?	○	○
Were you physically assaulted (do not include sexual assault)?	○	○
Were you verbally threatened?	○	○
Were you sexually touched without your consent?	○	○
Was sexual penetration attempted (vaginal, anal, oral) without your consent?	○	○
Were you sexually penetrated (vaginal, anal, oral) without your consent?	○	○
Were you a victim of stalking (e.g., waiting for you outside your classroom, residence, or office; repeated emails/phone calls)?	○	○

PAGE TWO

6. **Within the last 12 months, have you been in an intimate (coupled/partnered) relationship that was:**
(Please mark the appropriate column for each row)

	Yes	No
Emotionally abusive? (e.g., called derogatory names, yelled at, ridiculed)	○	○
Physically abusive? (e.g., kicked, slapped, punched)	○	○
Sexually abusive? (e.g., forced to have sex when you didn't want it, forced to perform or have an unwanted sexual act performed on you)	○	○

7. **How safe do you feel:**
(Please mark the appropriate column for each row)

	Very safe	Somewhat safe	Somewhat unsafe	Not safe at all
On this campus (daytime)?	○	○	○	○
On this campus (nighttime)?	○	○	○	○
In the community surrounding this school (daytime)?	○	○	○	○
In the community surrounding this school (nighttime)?	○	○	○	○

Alcohol, Tobacco, and Drugs

8. **Within the last 30 days, on how many days did you use:**
(Please mark the appropriate column for each row)

	Never used	Have used, but not in last 30 days	1-2 days	3-5 days	6-9 days	10-19 days	20-29 days	Used daily
Cigarettes	○	○	○	○	○	○	○	○
Tobacco from a water pipe (hookah)	○	○	○	○	○	○	○	○
Cigars, little cigars, clove cigarettes	○	○	○	○	○	○	○	○
Smokeless tobacco	○	○	○	○	○	○	○	○
Alcohol (beer, wine, liquor)	○	○	○	○	○	○	○	○
Marijuana (pot, weed, hashish, hash oil)	○	○	○	○	○	○	○	○
Cocaine (crack, rock, freebase)	○	○	○	○	○	○	○	○
Methamphetamine (crystal meth, ice, crank)	○	○	○	○	○	○	○	○
Other amphetamines (diet pills, bennies)	○	○	○	○	○	○	○	○
Sedatives (downers,ludes)	○	○	○	○	○	○	○	○
Hallucinogens (LSD, PCP)	○	○	○	○	○	○	○	○
Anabolic steroids (Testosterone)	○	○	○	○	○	○	○	○
Opiates (heroin, smack)	○	○	○	○	○	○	○	○
Inhalants (glue, solvents, gas)	○	○	○	○	○	○	○	○
MDMA (Ecstasy)	○	○	○	○	○	○	○	○
Other club drugs (GHB, Ketamine, Rohypnol)	○	○	○	○	○	○	○	○
Other illegal drugs	○	○	○	○	○	○	○	○

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

9. Within the last 30 days, how often do you think the typical student at your school used:

(State your best estimate; Please mark the appropriate column for each row)

	Never used	Have used, but not in last 30 days	1-2 days	3-5 days	6-9 days	10-19 days	20-29 days	Used daily
Cigarettes								
Tobacco from a water pipe (hookah)								
Cigars, little cigars, clove cigarettes								
Smokeless tobacco								
Alcohol (beer, wine, liquor)								
Marijuana (pot, weed, hashish, hash oil)								
Cocaine (crack, rock, freebase)								
Methamphetamine (crystal meth, ice, crank)								
Other amphetamines (diet pills, bennies)								
Sedatives (downers,ludes)								
Hallucinogens (LSD, PCP)								
Anabolic steroids (Testosterone)								
Opiates (heroin, smack)								
Inhalants (glue, solvents, gas)								
MDMA (Ecstasy)								
Other club drugs (GHB, Ketamine, Rohypnol)								
Other illegal drugs								

One drink of alcohol is defined as a 12 oz. can or bottle of beer or wine cooler, a 4 oz. glass of wine, or a shot of liquor straight or in a mixed drink.

10. The last time you "partied"/socialized how many drinks of alcohol did you have? (If you did not drink alcohol, please enter 00. If less than 10, enter 01, 02, 03, etc.)

DRINKS

11. The last time you "partied"/socialized over how many hours did you drink alcohol? (If you did not drink alcohol, please enter 00. If less than 10, enter 01, 02, 03, etc.)

HOURS

12. How many drinks of alcohol do you think the typical student at your school had the last time he/she "partied"/socialized? (If you think the typical student at your school does not drink alcohol, please enter 00. If less than 10, enter 01, 02, 03, etc.)

DRINKS

13. Over the last two weeks, how many times have you had five or more drinks of alcohol at a sitting?

- ○ N/A, don't drink
- ○ None
- ○ 1 time
- ○ 2 times
- ○ 3 times
- ○ 4 times
- ○ 5 times
- ○ 6 times
- ○ 7 times
- ○ 8 times
- ○ 9 times
- ○ 10 or more times

14. Within the last 30 days, did you:

(Please mark the appropriate column for each row)

	Yes	No	N/A, don't drink	N/A, don't drive
Drive after drinking any alcohol at all				
Drive after drinking five or more drinks of alcohol				

15. During the last 12 months, when you "partied"/socialized, how often did you:
(Please mark the appropriate column for each row)

	N/A, don't drink	Never	Rarely	Sometimes	Most of the time	Always
Alternate non-alcoholic with alcoholic beverages	○	○	○	○	○	○
Avoid drinking games	○	○	○	○	○	○
Choose not to drink alcohol	○	○	○	○	○	○
Determine, in advance, not to exceed a set number of drinks	○	○	○	○	○	○
Eat before and/or during drinking	○	○	○	○	○	○
Have a friend let you know when you have had enough	○	○	○	○	○	○
Keep track of how many drinks you were having	○	○	○	○	○	○
Pace your drinks to 1 or fewer per hour	○	○	○	○	○	○
Stay with the same group of friends the entire time you were drinking	○	○	○	○	○	○
Stick with only one kind of alcohol when drinking	○	○	○	○	○	○
Use a designated driver	○	○	○	○	○	○

16. Within the last 12 months, have you experienced any of the following when drinking alcohol?
(Please mark the appropriate column for each row)

	N/A, don't drink	No	Yes
Did something you later regretted	○	○	○
Forgot where you were or what you did	○	○	○
Got in trouble with the police	○	○	○
Someone had sex with me without my consent	○	○	○
Had sex with someone without their consent	○	○	○
Had unprotected sex	○	○	○
Physically injured yourself	○	○	○
Physically injured another person	○	○	○
Seriously considered suicide	○	○	○

17. Within the last 30 days, what percent of students at your school used:
State your best estimate. (If less than 10, please enter 00, 01, 02, etc.)

Cigarettes % Used	Alcohol % Used	Marijuana % Used
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○
○○	○○	○○

18. Within the last 12 months, have you taken any of the following prescription drugs that were not prescribed to you?
(Please mark the appropriate column for each row)

	No	Yes
Antidepressants (e.g., Celexa, Lexapro, Prozac, Wellbutrin, Zoloft)	○	○
Erectile dysfunction drugs (e.g., Viagra, Cialis, Levitra)	○	○
Pain killers (e.g., OxyContin, Vicodin, Codeine)	○	○
Sedatives (e.g., Xanax, Valium)	○	○
Stimulants (e.g., Ritalin, Adderall)	○	○

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SERIAL #

Sex Behavior and Contraception

19. Within the last 12 months, with how many partners have you had oral sex, vaginal intercourse, or anal intercourse? (If you did not have a sex partner within the last 12 months, please enter 00. If less than 10, enter 01, 02, 03, etc.) → PARTNERS

20. Within last 12 months, did you have sexual partner(s) who were:

(Please mark the appropriate column for each row)

	Yes	No
Female	○	○
Male	○	○
Transgender	○	○

21. Within the last 30 days, did you have:

(Please mark the appropriate column for each row)

	Yes	No, have done this sexual activity in the past but not in the last 30 days	No, have never done this sexual activity
Oral sex?	○	○	○
Vaginal intercourse?	○	○	○
Anal intercourse?	○	○	○

22. Within the last 30 days, how often did you or your partner(s) use a condom or other protective barrier (e.g., male condom, female condom, dam, glove) during:

(Please mark the appropriate column for each row)

CONDOM/BARRIER USE

	Have not done this sexual activity during the last 30 days	N/A, never did this sexual activity	Never	Rarely	Sometimes	Most of the time	Always
Oral sex?	○	○	○	○	○	○	○
Vaginal intercourse?	○	○	○	○	○	○	○
Anal intercourse?	○	○	○	○	○	○	○

23A. Did you or your partner use a method of birth control to prevent pregnancy the last time you had vaginal intercourse?

- ○ Yes (continue to item 23B)
- ○ N/A, have not had vaginal intercourse (skip to item 24)
- ○ No, have not had vaginal intercourse that could result in a pregnancy (skip to item 24)
- ○ No, did not want to prevent pregnancy (skip to item 24)
- ○ No, did not use any birth control method (skip to item 24)
- ○ Don't know (skip to item 24)

23B. Please indicate whether or not you or your partner used each of the following methods of birth control to prevent pregnancy the last time you had vaginal intercourse. (Please mark the appropriate column for each row)

	Yes	No		Yes	No
Birth control pills (monthly or extended cycle)	○	○	Diaphragm or cervical cap	○	○
Birth control shots	○	○	Contraceptive sponge	○	○
Birth control implants	○	○	Spermicide (e.g., foam, jelly, cream)	○	○
Birth control patch	○	○	Fertility awareness (e.g., calendar, mucous, basal body temperature)	○	○
Vaginal ring	○	○	Withdrawal	○	○
Intrauterine device (IUD)	○	○	Sterilization (e.g., hysterectomy, tubes tied, or vasectomy)	○	○
Male condom	○	○	Other method	○	○
Female condom	○	○			

24. **Within the last 12 months, have you or your partner(s) used emergency contraception ("morning after pill")?**

- ○ N/A, have not had vaginal intercourse in the last 12 months
- ○ No
- ○ Yes
- ○ Don't know

25. **Within the last 12 months, have you or your partner(s) become pregnant?**

- ○ N/A, have not had vaginal intercourse in the last 12 months
- ○ No
- ○ Yes, unintentionally
- ○ Yes, intentionally
- ○ Don't know

Weight, Nutrition, and Exercise

26. **How do you describe your weight?**

- ○ Very underweight
- ○ Slightly underweight
- ○ About the right weight
- ○ Slightly overweight
- ○ Very overweight

27. **Are you trying to do any of the following about your weight?**

- ○ I am not trying to do anything about my weight
- ○ Stay the same weight
- ○ Lose weight
- ○ Gain weight

28. **How many servings of fruits and vegetables do you usually have per day?**
(1 serving = 1 medium piece of fruit; 1/2 cup fresh, frozen, or canned fruits/vegetables; 3/4 cup fruit/vegetable juice; 1 cup salad greens; or 1/4 cup dried fruit)

○ 0 servings per day ○ 1–2 servings per day ○ 3–4 servings per day ○ 5 or more servings per day

29. **On how many of the past 7 days did you:**

(Please mark the appropriate column for each row)

	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
Do moderate-intensity cardio or aerobic exercise (caused a noticeable increase in heart rate, such as a brisk walk) for at least 30 minutes?	○	○	○	○	○	○	○	○
Do vigorous-intensity cardio or aerobic exercise (caused large increases in breathing or heart rate, such as jogging) for at least 20 minutes?	○	○	○	○	○	○	○	○
Do 8-10 strength training exercises (such as resistance weight machines) for 8-12 repetitions each?	○	○	○	○	○	○	○	○

Mental Health

30. **Have you ever:**

(Please mark the appropriate column for each row)

	Yes, in the last 12 months	Yes, in the last 30 days	Yes, in the last 2 weeks	No, not in last 12 months	No, never
Felt things were hopeless	○	○	○	○	○
Felt overwhelmed by all you had to do	○	○	○	○	○
Felt exhausted (not from physical activity)	○	○	○	○	○
Felt very lonely	○	○	○	○	○
Felt very sad	○	○	○	○	○
Felt so depressed that it was difficult to function	○	○	○	○	○
Felt overwhelming anxiety	○	○	○	○	○
Felt overwhelming anger	○	○	○	○	○
Intentionally cut, burned, bruised, or otherwise injured yourself	○	○	○	○	○
Seriously considered suicide	○	○	○	○	○
Attempted suicide	○	○	○	○	○

31. Within the last 12 months, have you been diagnosed or treated by a professional for any of the following?

(Please mark the appropriate column for each row)

	Yes, other treatment	Yes, treated with medication and psychotherapy	Yes, treated with psychotherapy	Yes, treated with medication	Yes, diagnosed but not treated	No
Anorexia	○	○	○	○	○	○
Anxiety	○	○	○	○	○	○
Attention Deficit and Hyperactivity Disorder (ADHD)	○	○	○	○	○	○
Bipolar Disorder	○	○	○	○	○	○
Bulimia	○	○	○	○	○	○
Depression	○	○	○	○	○	○
Insomnia	○	○	○	○	○	○
Other sleep disorder	○	○	○	○	○	○
Obsessive Compulsive Disorder (OCD)	○	○	○	○	○	○
Panic attacks	○	○	○	○	○	○
Phobia	○	○	○	○	○	○
Schizophrenia	○	○	○	○	○	○
Substance abuse or addiction (alcohol or other drugs)	○	○	○	○	○	○
Other addiction (e.g., gambling, internet, sexual)	○	○	○	○	○	○
Other mental health condition	○	○	○	○	○	○

32. Have you ever been diagnosed with depression? ○ No ○ Yes

33. Within the last 12 months, have any of the following been traumatic or very difficult for you to handle?

(Please mark the appropriate column for each row)

	Yes	No
Academics	○	○
Career-related issue	○	○
Death of a family member or friend	○	○
Family problems	○	○
Intimate relationships	○	○
Other social relationships	○	○
Finances	○	○
Health problem of a family member or partner	○	○
Personal appearance	○	○
Personal health issue	○	○
Sleep difficulties	○	○
Other	○	○

34. Have you ever received psychological or mental health services from any of the following?

(Please mark the appropriate column for each row)

	Yes	No
Counselor/Therapist/Psychologist	○	○
Psychiatrist	○	○
Other medical provider (e.g., physician, nurse practitioner)	○	○
Minister/Priest/Rabbi/Other clergy	○	○

PLEASE DO NOT WRITE IN THIS AREA

○○○

35. Have you ever received psychological or mental health services from your current college/university's Counseling or Health Service?
○ No ○ Yes

36. If in the future you were having a personal problem that was really bothering you, would you consider seeking help from a mental health professional?
○ No ○ Yes

37. Within the last 12 months, how would you rate the overall level of stress you have experienced?
○ No stress
○ Less than average stress
○ Average stress
○ More than average stress
○ Tremendous stress

Physical Health

38. Within the last 30 days, did you do any of the following?
(Please mark the appropriate column for each row)

	Yes	No
Exercise to lose weight	○	○
Diet to lose weight	○	○
Vomit or take laxatives to lose weight	○	○
Take diet pills to lose weight	○	○

39. Have you:
(Please mark the appropriate column for each row)

	Don't know	Yes	No
Had a dental exam and cleaning in the last 12 months?	○	○	○
(Males) Performed testicular self exam in the last 30 days?	○	○	○
(Females) Performed breast self exam in the last 30 days?	○	○	○
(Females) Had a routine gynecological exam in the last 12 months?	○	○	○
Used sunscreen regularly with sun exposure?	○	○	○
Ever been tested for Human Immunodeficiency Virus (HIV) infection?	○	○	○

40. Have you received the following vaccinations (shots)?
(Please mark the appropriate column for each row)

	Don't know	Yes	No
Hepatitis B	○	○	○
Human Papillomavirus/HPV (cervical cancer vaccine)	○	○	○
Influenza (the flu) in the last 12 months (shot or nasal mist)	○	○	○
Measles, Mumps, Rubella	○	○	○
Meningococcal disease (meningococcal meningitis)	○	○	○
Varicella (chicken pox)	○	○	○

41. **Within the last 12 months, have you been diagnosed or treated by a professional for any of the following?**

(Please mark the appropriate column for each row)

	Yes	No		Yes	No
Allergies	○	○	High blood pressure	○	○
Asthma	○	○	High cholesterol	○	○
Back pain	○	○	Human Immunodeficiency Virus (HIV)	○	○
Broken bone/Fracture/Sprain	○	○	Irritable Bowel Syndrome (IBS)	○	○
Bronchitis	○	○	Migraine headache	○	○
Chlamydia	○	○	Mononucleosis	○	○
Diabetes	○	○	Pelvic Inflammatory Disease (PID)	○	○
Ear infection	○	○	Repetitive stress injury		
Endometriosis	○	○	(e.g., carpal tunnel syndrome)	○	○
Genital herpes	○	○	Sinus infection	○	○
Genital warts/Human Papillomavirus (HPV)	○	○	Strep throat	○	○
Gonorrhea	○	○	Tuberculosis	○	○
Hepatitis B or C	○	○	Urinary tract infection	○	○

42. **On how many of the past 7 days did you get enough sleep so that you felt rested when you woke up in the morning?**

○ 0 days ○ 1 day ○ 2 days ○ 3 days ○ 4 days ○ 5 days ○ 6 days ○ 7 days

43. **People sometimes feel sleepy during the daytime. In the past 7 days, how much of a problem have you had with sleepiness (feeling sleepy, struggling to stay awake) during your daytime activities?**

○ No problem at all
○ A little problem
○ More than a little problem
○ A big problem
○ A very big problem

44. **In the past 7 days, how often have you:**

(Please mark the appropriate column for each row)

	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
Awakened too early in the morning and couldn't get back to sleep?	○	○	○	○	○	○	○	○
Felt tired, dragged out, or sleepy during the day?	○	○	○	○	○	○	○	○
Gone to bed because you just could not stay awake any longer?	○	○	○	○	○	○	○	○
Had an extremely hard time falling asleep?	○	○	○	○	○	○	○	○

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

Impediments to Academic Performance

(Please select the most serious outcome for each item below)

45. **Within the last 12 months, have any of the following affected your academic performance?**

	Significant disruption in thesis, dissertation, research, or practicum work	Received an incomplete or dropped the course	Received a lower grade in the course	Received a lower grade on an exam or important project	I have experienced this issue but my academics have not been affected	This did not happen to me/not applicable
Alcohol use	○	○	○	○	○	○
Allergies	○	○	○	○	○	○
Anxiety	○	○	○	○	○	○
Assault (physical)	○	○	○	○	○	○
Assault (sexual)	○	○	○	○	○	○
Attention Deficit and Hyperactivity Disorder (ADHD)	○	○	○	○	○	○
Cold/Flu/Sore throat	○	○	○	○	○	○
Concern for a troubled friend or family member	○	○	○	○	○	○
Chronic health problem or serious illness (e.g., diabetes, asthma, cancer)	○	○	○	○	○	○
Chronic pain	○	○	○	○	○	○
Death of a friend or family member	○	○	○	○	○	○
Depression	○	○	○	○	○	○
Discrimination (e.g., homophobia, racism, sexism)	○	○	○	○	○	○
Drug use	○	○	○	○	○	○
Eating disorder/problem	○	○	○	○	○	○
Finances	○	○	○	○	○	○
Gambling	○	○	○	○	○	○
Homesickness	○	○	○	○	○	○
Injury (fracture, sprain, strain, cut)	○	○	○	○	○	○
Internet use/computer games	○	○	○	○	○	○
Learning disability	○	○	○	○	○	○
Participation in extracurricular activities (e.g., campus clubs, organizations, athletics)	○	○	○	○	○	○
Pregnancy (yours or your partner's)	○	○	○	○	○	○
Relationship difficulties	○	○	○	○	○	○
Roommate difficulties	○	○	○	○	○	○
Sexually transmitted disease/infection (STD/I)	○	○	○	○	○	○
Sinus infection/Ear infection/Bronchitis/Strep throat	○	○	○	○	○	○
Sleep difficulties	○	○	○	○	○	○
Stress	○	○	○	○	○	○
Work	○	○	○	○	○	○
Other (please specify _____)	○	○	○	○	○	○

Demographic Characteristics

46. **How old are you?** → Years

47. **What is your gender?**
- ○ Female
- ○ Male
- ○ Transgender

48. **What is your sexual orientation?**
- ○ Heterosexual
- ○ Gay/Lesbian
- ○ Bisexual
- ○ Unsure

49. **What is your height in feet and inches?** → Ft. / Inch (HEIGHT)

50. **What is your weight in pounds?** → Pounds (WEIGHT)

51. **What is your year in school?**
- ○ 1st year undergraduate
- ○ 2nd year undergraduate
- ○ 3rd year undergraduate
- ○ 4th year undergraduate
- ○ 5th year or more undergraduate
- ○ Graduate or professional
- ○ Not seeking a degree
- ○ Other

52. **What is your enrollment status?**
○ Full-time ○ Part-time ○ Other

53. **Have you transferred to this college or university within the last 12 months?**
○ No ○ Yes

54. **How do you usually describe yourself?** *(Mark all that apply)*
- ○ White
- ○ Black or African American
- ○ Hispanic or Latino/a
- ○ Asian or Pacific Islander
- ○ American Indian, Alaskan Native, or Native Hawaiian
- ○ Biracial or Multiracial
- ○ Other

55. **Are you an international student?**
○ No ○ Yes

56. **What is your relationship status?**
- ○ Not in a relationship
- ○ In a relationship but not living together
- ○ In a relationship and living together

57. **What is your marital status?**
○ Single ○ Divorced
○ Married/Partnered ○ Other
○ Separated

58. **Where do you currently live?**
- ○ Campus residence hall
- ○ Fraternity or sorority house
- ○ Other college/university housing
- ○ Parent/guardian's home
- ○ Other off-campus housing
- ○ Other

59. **Are you a member of a social fraternity or sorority? (e.g., National Interfraternity Conference, National Panhellenic Conference, National Pan-Hellenic Council, National Association of Latino Fraternal Organizations)**
○ No ○ Yes

60. **How many hours a week do you work for pay?**
- ○ 0 hours
- ○ 1–9 hours
- ○ 10–19 hours
- ○ 20–29 hours
- ○ 30–39 hours
- ○ 40 hours
- ○ More than 40 hours

61. **How many hours a week do you volunteer?**
- ○ 0 hours
- ○ 1–9 hours
- ○ 10–19 hours
- ○ 20–29 hours
- ○ 30–39 hours
- ○ 40 hours
- ○ More than 40 hours

62. **What is your primary source of health insurance?**
- ○ My college/university sponsored plan
- ○ My parents' plan
- ○ Another plan
- ○ I don't have health insurance
- ○ I am not sure if I have health insurance

63. **What is your approximate cumulative grade average?**
○ A ○ B ○ C ○ D/F ○ N/A

64. **Within the last 12 months, have you participated in organized college athletics at any of the following levels?**

(Please mark the appropriate column for each row)	Yes	No
Varsity	○	○
Club sports	○	○
Intramurals	○	○

65. **Do you have any of the following?**

(Please mark the appropriate column for each row)	Yes	No
Attention Deficit and Hyperactivity Disorder (ADHD)	○	○
Chronic illness (e.g., cancer, diabetes, auto-immune disorders)	○	○
Deafness/Hearing loss	○	○
Learning disability	○	○
Mobility/Dexterity disability	○	○
Partial sightedness/Blindness	○	○
Psychiatric condition	○	○
Speech or language disorder	○	○
Other disability	○	○

66. **Are you currently or have you been a member of the United States Armed Services (Active Duty, Reserve, or National Guard)?**
- ○ No
- ○ Yes and I have deployed to an area of hazardous duty
- ○ Yes and I have not deployed to an area of hazardous duty

THANK YOU FOR COMPLETING THIS SURVEY

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

Appendix B

UNIVERSITY OF KANSAS
Office of Institutional Research and Planning

2/11

TABLE 4-001
HEAD COUNT ENROLLMENT — UNIVERSITY SUMMARY
FALL 2010

	Lawrence Campus		Medical Center		Total	
	Number	Percent	Number	Percent	Number	Percent
TOTAL HEAD COUNT	[illegible]	**100.0%**	**3,196**	**100.0%**	**29,462**	**100.0%**
UNDERGRADUATE [illegible]						
Undergraduate	[illegible]	75.6%	478	15.0%	20,330	69.0%
Graduate/ Professional	[illegible]	24.4%	1,949	61.0%	8,363	28.4%
Medical Residents, Fellows, and Trainees	–	–	769	24.1%	769	2.6%
SEX						
Male	13,292	50.6%	1,217	38.1%	14,509	49.2%
Female	12,974	49.4%	1,979	61.9%	14,953	50.8%
RESIDENCY						
Resident	18,147	69.1%	2,017	63.1%	20,164	68.4%
Nonresident	8,119	30.9%	1,179	36.9%	9,298	31.6%
RACE/ETHNICITY						
American Indian/ Alaskan Native	203	0.8%	22	0.7%	225	0.8%
Asian	981	3.7%	195	6.1%	1,176	4.0%
Black	858	3.3%	116	3.6%	974	3.3%
Hispanic	1,193	4.5%	111	3.5%	1,304	4.4%
Native Hawaiian/Pacific Islander	13	0.0%	–	0.0%	13	0.0%
White	19,975	76.0%	2,138	66.9%	22,113	75.1%
Two or More Races	522	2.0%	28	0.9%	550	1.9%
Nonresident Alien	2,135	8.1%	210	6.6%	2,345	8.0%
Unknown	386	1.5%	376	11.8%	762	2.6%
FULL TIME/PART TIME*						
Full Time	22,630	86.2%	2,593	81.1%	25,223	85.6%
Part Time	3,636	13.8%	603	18.9%	4,239	14.4%
LEVEL						
Freshman	5,075	19.3%	–	–	5,075	17.2%
Sophomore	4,277	16.3%	–	–	4,277	14.5%
Junior	4,470	17.0%	225	7.0%	4,695	15.9%
Senior	5,673	21.6%	252	7.9%	5,925	20.1%
Undergraduate Specials	357	1.4%	1	–	358	1.2%
Graduate/ Professional	6,414	24.4%	1,949	61.0%	8,363	28.4%
Medical Residents, Fellows, and Trainees	–	–	769	24.1%	769	2.6%
ON CAMPUS/OFF CAMPUS						
On Campus	24,718	94.1%	2,680	83.9%	27,398	93.0%
Off Campus	1,548	5.9%	516	16.1%	2,064	7.0%
AVERAGE AGE						
Undergraduate	21		26		21	
Graduate/ Professional	30		30		30	

* Beginning Fall 2008, all graduate students involved in thesis or dissertation preparation are counted as full-time, per federal IPEDS definitions.

Source: *IPEDS Fall 2010 Enrollment; Kansas Higher Education Enrollment Report, Fall 2010; Demographic Report, Fall 2010; Age Distribution Report, Fall 2010.*

UNIVERSITY OF KANSAS
Office of Institutional Research and Planning

9/10

TABLE 4-104
HEAD COUNT DISTRIBUTION BY SEX
FALL 2010
University of Kansas
Lawrence and Edwards Campuses

Distribution by Sex	Male	Percent of Total	Female	Percent of Total	Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19,852
[illegible]	3,060	[illegible]	3,364	[illegible]	6,414
TOTAL	13,292	50.6%	12,974	49.4%	26,266

Source: "Board of Regents Demographics Report, Fall 2010," Institutional Research and Planning.

UNIVERSITY OF KANSAS
Office of Institutional Research and Planning

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TABLE 4-115 (continued)
STUDENT HEAD COUNT BY LEVEL BY RACE/ETHNICITY (SELF-REPORTED)
FALL 1990-2010
University of Kansas
Lawrence and Edwards Campuses

UNDERGRADUATE - NEW FEDERAL RACE/ETHNICITY CATEGORIES

Fall	American Indian/ Alaskan Native	Asian	Black	Hispanic	Native Hawaiian/ Pacific Islander	White	Two or More Races	Nonresident Alien	Unknown	Total
2010	138	773	675	956	11	15,494	430	1,181	194	19,852

Note: Beginning Fall 2010, Federal Reporting Guidelines required institutions to collect race/ethnicity information in a two question format. Students who answered the first question (Are you Hispanic?) in the affirmative are included in the Hispanic counts but may have reported other race/ethnicities for the second question. Students answering no to the first question were allowed to select one or more race/ethnic categories in the second question. A new category, Native Hawaiian/Pacific Islander, was included in the second question selection.

(continued)

UNIVERSITY OF KANSAS
Office of Institutional Research and Planning

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TABLE 4-115 (concluded)
HEAD COUNT BY LEVEL AND RESIDENCY
FALL 1990-2010
University of Kansas
Lawrence and Edwards Campuses

GRADUATE - NEW FEDERAL RACE/ETHNICITY CATEGORIES

Fall	American Indian/ Alaskan Native	Asian	Black	Hispanic	Native Hawaiian/ Pacific Islander	White	Two or More Races	Nonresident Alien	Unknown	Total
2010	65	208	183	237	2	4,481	92	954	192	6,414

Note: Beginning Fall 2010, Federal Reporting Guidelines required institutions to collect race/ethnicity information in a two question format. Students who answered the first question (Are you Hispanic?) in the affirmative are included in the Hispanic counts but may have reported other race/ethnicities for the second question. Students answering no to the first question were allowed to select one or more race/ethnic categories in the second question. A new category, Native Hawaiian/Pacific Islander, was included in the second question selection.

Source: *Board of Regents Demographics Report*, various years, University Registrar.

Appendix C

KU RESEARCH & GRADUATE STUDIES
The University of Kansas

1/12/2011
HSCL #19118

Heidi Garcia
1200 Schwegler Drive
Lawrence, KS 66045

The Human Subjects Committee, Lawrence Campus (HSCL) has received your response to its expedited review of your research project

19118 Garcia (STUDENT HEALTH SERV) National College Health Assessment

and approved this project under the expedited procedure provided in 45 CFR 46.110 (f) (7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Since your research presents no risk to participants and involves no procedures for which written consent is normally required outside of the research context HSCL may waive the requirement for a signed consent form (45 CFR 46.117 (c) (2). Your information statement meets HSCL requirements. The Office for Human Research Protections requires that your information statement must include the note of HSCL approval and expiration date, which has been entered on the form sent back to you with this approval.

1. At designated intervals until the project is completed, a Project Status Report must be returned to the HSCL office.
2. Any significant change in the experimental procedure as described should be reviewed by this Committee prior to altering the project.
3. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at http://www.rcr.ku.edu/hscl/hsp_tutorial/000.shtml.
4. Any injury to a subject because of the research procedure must be reported to the Committee immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform HSCL when this project is terminated. You must also provide HSCL with an annual status report to maintain HSCL approval. Unless renewed, approval lapses one year after approval date. If your project receives funding which requests an annual update approval, you must request this from HSCL one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Mary Denning
Coordinator
Human Subjects Committee Lawrence

Appendix D

TO: [Faculty Member]

FROM: Barbara Romzek, Interim Sr. Vice Provost for Academic Affairs
Heidi Garcia, Health Education Resource Office Manager, Student Health Services

SUBJECT: National College Health Assessment - Spring 2011

Dear [Faculty Member],

KU is one of many colleges and universities across the nation that participates in the National College Health Assessment, the largest comprehensive survey on the health of college students. This nationally recognized research survey is a component of the American College Health Association and is comprised of questions to assist in collecting precise data about our students' health habits, behaviors, and perceptions within a broad range of topics. The data obtained are essential for the creation and evaluation of campus programs that promote health and student success – both in and out of the classroom.

A sample of classes from across the Lawrence campus has been selected to closely represent the overall KU student population by gender, level, and school. The students in your class listed below have been selected to help achieve this balance.

Course:
Time:
Days:
Place:

With your permission, Student Health Services plans to administer the survey during a regularly scheduled class period. We hope that you will be able to schedule approximately 40 minutes during a class period in April to allow your students the opportunity to complete this survey.

We know this is a significant disruption and appreciate your understanding. Snack bars will be provided during the class period in which the survey occurs in appreciation of your participation. Thank you in advance for your help in this important endeavor.

This request is being sent at this time of the semester so that, if you choose to cooperate, you can anticipate this block of time in your course planning. Please reply to this email by Friday, January 28th with the best day and time in April for the survey to be administered in your class. You will receive an email confirmation of the scheduled day.

If you have any questions or concerns, please feel free to contact Heidi Garcia, Principal Investigator, at (785) 864-9752.

Again, thank you for your support!

Appendix E

ACHA NCHA
American College Health Association National College Health Assessment

Institution of Higher Education Demographic Survey

Data from all participating institutions are aggregated for the comparative studies by various types of institutional characteristics. For that purpose, please furnish the data requested below and return this form with your questionnaires. Because this form is used to control the processing of questionnaires, survey responses cannot be returned until this information is complete. In no instance will your institution be singled out for comparison with others in the aggregated analysis.

Section I. Institutional Characteristics

1. Institution Name

Please specify UNIVERSITY OF KANSAS

2. Survey Period

Fall or Spring SPRING Year 2011

3. Student Enrollment

Total Student Enrollment	26,266
Total Undergraduate Enrollment	12,852
Total Graduate Enrollment	6,414
Total Non-Degree Seeking/Other Enrollment	—

If separate data are unavailable for undergraduate and graduate, please provide composite data for both in the undergraduate column and check here: ○

If your institution serves only undergraduate OR graduate, complete the appropriate box and leave the other blank.

Undergraduate	
% Female	48.4%
% Male	51.6%
% White, non-Hispanic	78%
% Black, non-Hispanic	3.4%
% Hispanic or Latino	4.8%
% Asian or Pacific Islander	3.2%
% Native American or Alaskan Native	.07%
% International	5.2%
% Other	5.1%

Graduate	
% Female	52.4%
% Male	47.6%
% White, non-Hispanic	69.2%
% Black, non-Hispanic	2.2%
% Hispanic or Latino	3.7%
% Asian or Pacific Islander	3.5%
% Native American or Alaskan Native	1.0%
% International	14.2%
% Other	4.4%

4. American College Health Association Affiliation

- ☑ ACHA Institutional Member (Please specify Institution Member ID #: 325)
- ○ Non-Member Institution

5. Institutional Control

- ☑ Public
- ○ Private

6. Religious Affiliation

- ○ Yes (Please specify: _____)
- ☑ No

Section I, Continued. Institutional Characteristics

7. Minority Serving Institution Status (select all that apply)

For information regarding your IHE's classification as a minority serving institution, please visit http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html

- ○ Postsecondary Minority Institution
- ○ Historically Black College or University (HBCU)
- ○ High Hispanic Enrollment
- ○ Hispanic Serving Institution (HSI)
- ○ Indian Tribally Controlled College or University
- ○ Alaska Native-Serving Institution
- ○ Native Hawaiian-Serving Institution

8. Institutional Type

- ○ Two-year
- ✓ Four-year or more
- ○ Other (Please specify: _____)

9. Carnegie Classification

For information regarding your classification, visit http://www.carnegiefoundation.org/classifications/index.asp?key=782, find your campus listing, and note the "Basic" Carnegie Classification for your campus below.

Associate's Colleges
- ○ Public Rural-Serving Small
- ○ Public Rural-Serving Medium
- ○ Public Rural-Serving Large
- ○ Public Suburban-Serving Single Campus
- ○ Public Suburban-Serving Multicampus
- ○ Public Urban-Serving Single Campus
- ○ Public Urban-Serving Multicampus
- ○ Public Special Use
- ○ Private Nonprofit
- ○ Private For-profit
- ○ Public 2-year under 4-year Universities
- ○ Public 4-year, Primarily Associate's
- ○ Private Nonprofit 4-year, Primarily Associate's
- ○ Private For-profit 4-year, Primarily Associate's

Baccalaureate Colleges
- ○ Arts and Sciences
- ○ Diverse Fields
- ○ Baccalaureate/Associate's Colleges

Master's Colleges and Universities
- ○ Larger Programs
- ○ Medium Programs
- ○ Smaller Programs

Research Institutions
- ✓ Research Universities (very high research activity)
- ○ Research Universities (high research activity)
- ○ Doctoral/Research Universities

Special Focus Institutions
- ○ Faith-Related
- ○ Medical
- ○ Other Health
- ○ Engineering
- ○ Other Technology
- ○ Business
- ○ Art/Music/Design
- ○ Law
- ○ Other

Miscellaneous
- ○ Tribal College
- ○ Classification Pending
- ○ Unclassified

10. National Collegiate Athletic Association (NCAA) Division

Please mark highest division applicable to a sport at your institution.
To determine your division membership, please visit http://web1.ncaa.org/memberLinks/links.jsp

- ✓ Division I
- ○ Division II
- ○ Division III

Section 1, Continued. **Institutional Characteristics**

11. CAMPUS LOCALE

- ○ Very large city (population over 500,000)
- ○ Large city (population of 250,000 - 499,999)
- ✓ Small city (population of 50,000 - 249,999)
- ○ Large town (population of 10,000 - 49,999)
- ○ Small town (population of 2,500 - 9,999)
- ○ Rural community (population under 2,500)

12. CAMPUS HEALTH INSURANCE MODEL

- ○ We offer no form of student health insurance and students are responsible for their own coverage
- ✓ Voluntary (*Students have the option of purchasing your institution's health insurance plan but are not required to show any proof of insurance to your institution*)
- ○ Soft Waiver (*Students are mandated to have health insurance coverage comparable to your institution's plan, and if so, they may waive your institutional plan without proof of alternative coverage*)
- ○ Hard Waiver (*Students are mandated to have health insurance coverage comparable to your institution's plan, and if so, they may waive your institutional plan with proof of alternate coverage*)
- ○ Mandatory (*All students are mandated to purchase your institution's student health insurance regardless of outside insurance coverage*)
- ○ Other (Please specify: _____)

Section 2. **Survey Characteristics**

1. PURPOSE OF SURVEY

- ○ Pre-test (e.g., before educational program or campus-wide intervention)
- ○ Post-test (e.g., after educational program or campus-wide intervention)
- ✓ General assessment of student beliefs, behaviors, and experiences
- ○ Other (Please specify: _____)

2. DATE ADMINISTERED

Start date 4.13.11 End date 5.10.11

3. STUDENT SAMPLE CHARACTERISTICS (I surveyed…)

- ✓ All of the different types of students who attend my institution
- ○ Only a particular group of students (e.g., undergraduates, freshmen, athletes, medical students, commuters) (Please specify: _____)

4. INCENTIVES

- ○ Students who completed the ACHA-NCHA were entered into a random drawing for an incentive (Pease specify incentive: _____)
- ✓ All students who completed the ACHA-NCHA received an incentive (Please specify incentive: SAMPLE-SIZED GRANOLA BAR)
- ○ I did not offer students who completed the ACHA-NCHA an incentive for their participation

5. SURVEY TYPE (I surveyed using…)

- ✓ Paper-based surveys (Complete Section 2A on the next page)
- ○ Online/Web-based surveys (Complete Section 2B on the next page)

***Section 2A:* Paper-based survey characteristics**

6A. SAMPLING PROCEDURES

Classroom Sampling

- ☑ Surveyed random selection of classes from across institution
- ○ Surveyed other random selection of classes (e.g, all sections of a particular class required by all students)
  (Please specify: _____)
- ○ Surveyed non-random selection of classrooms (e.g., classes taught by personal acquaintances)
  (Please specify: _____)

Please specify the number of classrooms surveyed: 13

Mailed Sampling

- ○ Mailed survey to all students at institution
- ○ Mailed survey to all students in a particular subgroup (e.g, commuters, undergraduates, graduates)
  (Please specify: _____)
- ○ Mailed survey to random selection of students at institution
- ○ Mailed survey to random selection of students in a particular subgroup (e.g, commuters, undergraduates)
  (Please specify: _____)
- ○ Mailed survey to a non-random selection of students (e.g., students who participated in a program)
  (Please specify: _____)

Convenience Sampling

- ○ Convenience sample (e.g., students coming to student health, students eating lunch in the student union)
  (Please specify: _____)

Other

- ○ Other (Please specify: _____)

7A. SURVEY DISTRIBUTION

How many surveys did you distribute? 1048

***Section 2B:* Online/Web-based survey characteristics**

6B. SAMPLING PROCEDURES

E-Mailed Sampling

- ○ E-mailed survey to all students at institution
- ○ E-mailed survey to all students in a particular subgroup (e.g, commuters, undergraduates, graduates)
  (Please specify: _____)
- ○ E-mailed survey to random selection of students at institution
- ○ E-mailed survey to random selection of students in a particular subgroup (e.g, commuters, graduates)
  (Please specify: _____)
- ○ E-mailed survey to a non-random selection of students (e.g., students who participated in a program)
  (Please specify: _____)

Convenience Sampling

- ○ Convenience sample (e.g., posting survey URL on institution website or on posters)
  (please specify: _____)

7B. SURVEY DISTRIBUTION

How many students did you invite to participate? _____

Check here if you would like ACHA to determine: ○

Section 3. Data Agreement and Contact Information

Thank you for completing the above information and for helping us better use the ACHA-NCHA survey data in developing normative information for a variety of variables.

The ACHA-NCHA is being used across the nation to assess student health risks, beliefs, behaviors, and consequences. Each participating institution of higher education (IHE) receives a copy of its data file and reports for the purposes of analysis, research, and program planning. Additionally, each participating institution receives an aggregate report with data from all IHEs using random sampling methodologies that participated in the same survey period. The creation of this large national data file and aggregate report allows you to compare your students to a national sample. It also provides the opportunity for a greater understanding of student health, what works to reduce student health risks and consequences, and what changes can be brought about over time. In light of this opportunity, we are asking your permission to analyze, report on, and use the data collected from your students to further both our understanding of student health needs identified by the ACHA-NCHA and the ability of IHEs to meet these needs.

By signing below, I hereby agree to the following statement:
"I, as the ACHA-NCHA program representative at my institution, give the American College Health Association permission to analyze, report on, and otherwise use the aggregate data. I understand that all information in the aggregate data is protected and that the identity of my institution and the students who complete the ACHA-NCHA will remain confidential at all times."

Signature _____ Date 6/16/11

Name _____
Institution _____
Phone _____
Address _____

THE UNIVERSITY OF KANSAS
Student Success

Heidi Garcia, MSE
Manager

Wellness Resource Center
Watkins Health Center
1200 Schwegler Drive, Room 1800B
Lawrence, KS 66045-7559

(785) 864-9752
Fax (785) 864-9596
hmgarcia@ku.edu
www.studenthealth.ku.edu

When all sections are complete, please either mail or fax this survey to:

American College Health Association

P.O. Box 28937
Baltimore, MD 21240
410.859.1510 (fax)

Direct all inquiries regarding completion of this survey to:

Mary T. Hoban, Ph.D., CHES
Director, ACHA-NCHA Program Office
410.859.1500 (phone)
mhoban@acha.org

Appendix F

Variable Labels

Sleep Quality Somnolence: Unobserved latent variable identified by four observed sleep quality indicator variables (rested, sleepiness, tired, and go to bed).

Sleep Quality Insomnia: Unobserved latent variable identified by two observed sleep quality indicator variables (awake early and sleep latency).

Rested: On how many of the past 7 days did you get enough sleep so that you felt rested when you woke up in the morning?

Sleepiness: In the past 7 days, how much of a problem have you had with sleepiness (feeling sleepy, struggling to stay awake) during your daytime activities?

Tired: In the past 7 days, how often have you felt tired, dragged out, or sleepy during the day?

Go To Bed: In the past 7 days, how often have you gone to bed because you just could not stay awake any longer?

Awake Early: In the past 7 days, how often have you awakened too early in the morning and couldn't get back to sleep?

Sleep Latency: In the past 7 days, how often have you had an extremely hard time falling asleep?

Age: Age in years.

Gender: Identification as male or female.

Class: Identification as particular undergraduate year in school.

Enrollment Status: Identification as enrolled in school full-time or part-time/other.

Ethnicity: Identification as Non-Hispanic white or other ethnicity.

On Campus Housing: Identification as residing in campus residence hall or other campus housing besides Greek housing, versus off campus housing of any sort.

Greek Housing: Identification as residing in Greek housing (fraternity or sorority), versus any other type of housing.

Hours Worked: Hours worked per week.

Hours Volunteered: Hours volunteered per week.

Varsity Athlete: Identification as participating in varsity athletics at the university or not.

Sleep Disorder Diagnosis: Identification as being diagnosed with insomnia and/or other sleep disorder in the last 12 months.

Anxiety or Depression Diagnosis: Within the last 12 months, have you been diagnosed or treated by a professional for depression or anxiety?

Poor General Health: How would you describe your general health?

High Stress: Within the last 12 months, how would you rate the overall level of stress you have experienced?

BMI: Body Mass Index (BMI), as measured by height in feet and inches and weight in pounds.

Tobacco: Within the last 30 days did you use tobacco?

Alcohol: Within the last 30 days did you use alcohol?

Marijuana: Within the last 30 days did you use marijuana?

Illicit Stimulant: Within the last 30 days did you use illicit stimulants?

Illicit Depressants: Within the last 30 days did you use illicit depressants?

Other Illicit Drugs: Within the last 30 days did you use other illicit drugs**?**

Frequency of Binge Drinking: Over the last two weeks, how many times have you had five or more drinks of alcohol at a sitting?

Cardio Physical Activity Recommendations/PAREQ: Cardiovascular physical activity guidelines as defined by the American College of Sports Medicine and the American Heart Association (Harvey et al., 2007) (Moderate-intensity cardio or aerobic exercise for at least 30 minutes on 5 or more days per week, or vigorous-intensity cardio or aerobic exercise for at least 20 minutes on 3 or more days per week) met or not met?

Appendix G

Pruned Paths

Paths Pruned as Predictors for Sleep Quality Somnolence
Age
Class
Enrollment Status
Ethnicity
On Campus Housing
Greek Housing
Hours Worked
Hours Volunteered
Varsity Athlete
BMI
Tobacco
Alcohol
Marijuana
Illicit Stimulant
Illicit Depressants
Other Illicit Drugs
PAREQ
Anxiety or Depression Diagnosis

Paths Pruned as Predictors for Sleep Quality Insomnia
Age
Gender
Class
Enrollment Status
Ethnicity
On Campus Housing
Greek Housing
Hours Worked
Hours Volunteered
Varsity Athlete
Poor General Health
High Stress
BMI
Tobacco
Alcohol
Marijuana
Illicit Stimulant
Illicit Depressants
Other Illicit Drugs
PAREQ

Appendix H

Correlations for Exogenous Predictor Variables

Table H1

Correlations for Exogenous Predictor Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Age	1																						
2. Gender	0.15	1																					
3. Class	0.89	0.14	1																				
4. Enrollment Status	0.06	-0.06	-0.02	1																			
5. Ethnicity	0.04	-0.03	0.06	0.01	1																		
6. On Campus Housing	-0.44	-0.12	-0.48	0.00	-0.11	1																	
7. Greek Housing	-0.06	-0.06	-0.08	0.05	0.10	-0.25	1																
8. Hours Worked	0.20	0.01	0.22	-0.06	0.01	-0.18	-0.16	1															
9. Hours Volunteered	-0.05	-0.15	0.01	-0.08	0.01	-0.01	0.19	0.06	1														
10. Varsity Athlete	-0.13	0.04	-0.14	-0.12	-0.08	0.07	-0.09	-0.08	-0.06	1													
11. Sleep Disorder	-0.04	-0.01	0.01	-0.02	-0.07	0.03	-0.06	0.05	0.10	0.04	1												
12. Poor General Health	0.08	-0.05	0.08	0.07	0.00	-0.09	0.01	0.05	0.01	-0.15	0.16	1											
13. High Stress	0.08	-0.19	0.13	0.10	0.05	-0.02	-0.09	0.11	0.04	-0.09	0.15	0.21	1										
14. BMI	0.03	0.20	0.04	-0.02	-0.08	0.01	-0.04	0.05	-0.05	0.00	0.04	0.20	0.00	1									
15. Tobacco	0.02	0.30	0.03	0.01	0.04	-0.08	0.05	0.06	-0.01	0.02	0.14	0.09	-0.05	0.11	1								
16. Alcohol	0.17	-0.01	0.20	0.00	0.22	-0.16	0.08	0.03	0.01	-0.08	-0.03	0.06	0.08	0.04	0.16	1							
17. Marijuana	0.00	0.13	0.02	0.05	0.06	-0.06	0.07	-0.04	-0.01	-0.06	0.11	0.12	0.02	0.02	0.35	0.25	1						
18. Illicit Stimulant	0.07	0.07	0.10	-0.06	0.01	-0.07	0.03	0.08	-0.01	0.02	0.11	0.05	0.01	0.04	0.15	0.09	0.20	1					
19. Illicit Depressants	0.06	0.11	0.06	0.03	0.00	-0.07	0.05	0.05	-0.01	0.09	0.23	0.08	-0.03	0.01	0.17	0.07	0.17	0.45	1				
20. Other Illicit Drugs	0.01	0.10	0.01	0.03	0.03	-0.07	0.03	0.03	0.01	-0.01	0.11	0.06	0.00	0.02	0.26	0.09	0.30	0.29	0.35	1			
21. Freq of Binge Drinking	0.10	0.27	0.14	-0.06	0.12	-0.18	0.17	0.02	-0.04	-0.04	-0.01	0.04	-0.14	0.08	0.33	0.32	0.36	0.19	0.13	0.16	1		
22. PAREQ	-0.01	0.05	-0.03	-0.05	0.07	0.03	0.04	-0.01	0.03	0.15	-0.02	-0.21	-0.15	-0.02	-0.01	-0.02	0.01	-0.01	-0.02	0.03	0.08	1	
23. Anxiety or Depression	0.10	-0.12	0.14	0.00	0.03	-0.07	-0.04	0.07	0.00	0.00	0.40	0.10	0.21	0.00	0.04	0.08	0.07	0.11	0.11	0.07	0.03	0.04	1